

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 Regulations 2005, 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 69). This table indicates a slight increase in the overall contamination rate in animal feedingstuffs between 2004 and 2005, from 1.4% to 1.5%. The number of tests carried out (33171) was 9.8% lower compared with 2004, and 17.5% lower than the number carried out in 2003.

Tables 70 and 71 give results of *S. Typhimurium* and *S. Enteritidis* isolations from feedingstuffs. The number of isolations of *S. Enteritidis* remained low, and there was a fall in the number of reports of *S. Typhimurium* compared with 2004 (2 and 15 respectively out of 33,171 tests carried out – in 2004 the respective figures were 1 and 25 isolates).

Tables 72, 73 and 74 show the top serotypes isolated from compound ruminant, pig and poultry feed respectively. The most frequently isolated serotypes in 2005 were *S. Senftenberg*, *S. Livingstone*, *S. Kedougou* and *S. Ohio*. 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 75). 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 2005

and was also found in soya, barley, wheat and compound poultry feed. The most frequently isolated serovar from compound poultry feed was *S. Kedougou* which was also isolated from a variety of feed ingredients. 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 feed ingredients. There were isolations of *S. Bovis morbificans*, *S. Enteritidis*, *S. Paratyphi B* var Java and *S. Typhimurium* reported from unspecified vegetable feed ingredients (1, 2, 1 and 6 isolations respectively) in addition to six isolations of *S. Montevideo* and two isolations of *S. Typhimurium* from feedstuffs that were not specified as either compound feeds or feed ingredients.

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 and have since been replaced by the Animal By Products Regulations 2005.

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 2005 (287) was considerably higher than in 2004 (150) (Table 76), and the overall contamination rate in 2005 rose to 2.8% with 0.7% in 2004.

The contamination rate of 2.9% for imported animal proteins (Table 78) was lower than in 2004 (4.6%) and, in addition, the number of batches tested fell to 70 in 2005 compared with 87 in 2004.

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

Tables 77 and 79 show the serovars reported from testing of domestically produced and imported animal protein respectively.

**Table 69: Animal feedingstuffs and ingredients contamination rates
(Tests being performed under the Animal By-Products Order 1999 and
Defra Codes of Practice) 2004 - 2005**

Product	2004			2005		
	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	3576	32	0.9	4896	116	3.2
GB and imported processed animal protein arriving for feedingstuffs use	1153	36	3.1	803	28	2.4
Oilseed meals and products for feedingstuffs use	10364	337	3.3	8776	185	1.8
Non-oilseed meal vegetable products	8845	35	0.4	7839	106	1.2
Ruminant concentrates	1982	5	0.3	1959	6	0.3
Pig extrusions	1591	9	0.6	1325	5	0.3
Pig and poultry meals	3069	25	0.8	2639	32	1.0
Poultry extrusions	5299	12	0.2	4236	15	0.3
Protein concentrate	511	6	1.2	340	8	1.6
Minerals/other	380	0	0	358	1	0.3
Total	36770	497	1.4	33171	502	1.5

Table 70: *Salmonella* Enteritidis and *S. Typhimurium* in feedingstuff ingredients 2004 - 2005

Type of Material	2004		2005	
	S. Enteritidis	S. Typhimurium	S. Enteritidis	S. Typhimurium
Finished feeds	1	4	-	3
Animal protein	-	1	-	-
Vegetable material	-	5	-	2
Minerals	-	-	-	-
Miscellaneous	-	15	2	10
Total	1	25	2	15

Table 71: Isolations of *S. Enteritidis* and *S. Typhimurium* from products monitored under the Defra Codes of Practice, 2005

<i>Salmonella</i> serotype	Feedingstuff	Number
Enteritidis	unspecified	2
Typhimurium	pig compound feed	1
	poultry compound feed	1
	ruminant compound feed	1
	rice bran	1
	wheat	2
	unspecified	9

Table 72: The serotypes of *Salmonella* isolated from compound ruminant feed in 2005, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2004	<i>Salmonella</i> serotype	Isolations 2005
Kedougou	3	Agona	1
Lexington	2	Binza	1
Agona	1	Carno	1
Carno	1	Mbandaka	1
Cubana	1	Montevideo	1
Livingstone	1	Typhimurium	1
Typhimurium	1	Yoruba	1
Virchow	1	30::-:ENX	1
6,7:rough:-	1		

Table 73: The top 3 serotypes of *Salmonella* isolated from compound pig feed in 2005, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2004	<i>Salmonella</i> serotype	Isolations 2005
Agona	3	Senftenberg	5
Kedougou	2	Kedougou	4
Mbandaka	2	Typhimurium	1
Typhimurium	2	Yoruba	1

Table 74: The top 3 serotypes of *Salmonella* isolated from compound poultry feed in 2005, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2004	<i>Salmonella</i> serotype	Isolations 2005
Yoruba	5	Kedougou	6
Kedougou	4	Livingstone	4
Mbandaka	4	Ohio	4
Kentucky	3	Agona	2
Rissen	3	Rissen	2
		Tennessee	2

Table 75: The major serotypes of *Salmonella* in feedingstuff ingredients 2005, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2004	Isolations 2005
Barley	Arizonae (unspecified)	0	1
	Rissen	1	1
	Amager	0	1
	Babelsberg	0	1
Cocoa	Ibadan	1	2
	Indiana	1	0
	Kibusi	0	1
	Lille	0	1
	Malaysia	0	1
	Malstatt	0	1
	Maritzburg	0	2
	Rubislaw	1	0
	Soerenga	0	1
	Somone	0	1
	Teltow	0	2
	Typhimurium	1	0
	Utah	0	1
	Vinohrady	0	2
	16:-:-	0	1
	28:-:-	0	1
	28:i:-	0	1
	4.12:-:-	0	1
	Untyped	2	0
	Linseed	Mbandaka	13
Senftenberg		1	1
Tennessee		0	1
Untyped		1	0
Maize	Agona	1	0
	Kedougou	1	0
	Senftenberg	1	0
	Untyped	1	0
Palm Kernel	Agona	0	2
	Cannstatt	2	0
	Carno	2	0
	Cotham	1	0
	Cubana	1	0
	Havana	0	1
	Lexington	1	0
	Livingstone	1	0
	Mbandaka	1	0
	Molade	1	0
	Ruiru	1	1
	Senftenberg	7	0
	Tees	1	0
	Tennessee	1	1
	3,19:-:-	0	1

Table 75 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2005, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2004	Isolations 2005
Rape	Agama	4	2
	Agona	3	1
	Derby	2	0
	Give	0	1
	Kedougou	2	0
	Mbandaka	17	14
	Oranienburg	0	1
	Rissen	168	75
	Senftenberg	3	3
	Tennessee	1	6
	4:b:-	0	5
	6,7:-:-	0	1
	Untyped	2	0
	Rice Bran	Anatum	0
Cubana		0	1
Mbandaka		0	1
Typhimurium		0	1
Soya	Agama	0	2
	Agona	6	6
	Alachua	0	1
	Anatum	1	0
	Corvallis	1	1
	Cubana	3	2
	Derby	2	0
	Ealing	0	1
	Hadar	2	0
	Havana	0	2
	Ilugun	2	0
	Infantis	1	0
	Jerusalem	0	1
	Kedougou	2	0
	Kentucky	1	0
	Kingston	1	0
	Leiden	1	0
	Lexington	1	0
	Livingstone	3	2
	Mbandaka	28	5
	Meleagridis	3	1
	Minnesota	1	0
	Montevideo	1	0
	Orion	0	1
	Ouakam	1	0
	Poona	0	1
	Rissen	8	0
	Senftenberg	17	17
	Soerenga	0	1
	Sundsvall	1	0
	Tennessee	3	2

Table 75 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2005, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2004	Isolations 2005
	Typhimurium	1	0
	Yoruba	5	11
	16:-:l,w	0	1
	3,10:rough:-	0	1
	3,19:-:-	0	3
	3,19:i:-	0	1
	3,19:rough:-	0	1
	4:b:-	0	1
	6,7:-:-	3	0
	6,7:-:l,w	0	1
	9:12:-:-	0	1
	Rough	1	0
	Untyped	11	0
Sunflower	Agona	1	0
	Derby	1	0
	Give	1	0
	Havana	0	1
	Livingstone	1	0
	Mbandaka	9	0
	Senftenberg	1	4
	6,7:z10:-	0	1
	Untyped	1	0
Wheat	Agama	0	1
	Berta	0	1
	Hadar	0	1
	Kedougou	1	2
	Nagoya	0	1
	Newport	1	0
	Rissen	1	0
	Senftenberg	1	0
	Stourbridge	1	0
	Taksony	1	0
	Typhimurium	3	2
Fishmeal	Anatum	1	1
	Cerro	0	1
	Corvallis	4	0
	Give	0	2
	Havana	0	1
	Indiana	3	1
	Mbandaka	1	1
	Montevideo	0	2
	Oslo	0	1
	Rissen	0	1
	Senftenberg	3	0
	Tennessee	1	0
	Typhimurium	1	0

Table 75 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2005, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2004	Isolations 2005
Other	Adelaide	1	0
	Agama	1	2
	Agona	3	7
	Anatum	4	26
	Bovis morbificans	0	1
	Corvallis	1	1
	Cubana	1	1
	Derby	2	4
	Dublin	0	1
	Ealing	2	1
	Enteritidis	0	2
	Hartford	0	1
	Havana	1	0
	Heidelberg	1	0
	Indiana	2	1
	Infantis	4	0
	Kedougou	4	2
	Kentucky	1	0
	Kingston	0	1
	Lexington	1	0
	Livingstone	0	6
	London	2	0
	Mbandaka	6	3
	Meleagridis	1	1
	Montevideo	2	3
	Orion	0	1
	Ouakam	1	0
	Poona	1	0
	Paratyphi B var Java	0	1
	Reading	1	1
	Rissen	0	2
	Senftenberg	4	0
	Schwarzengrund	0	3
	Senftenberg	0	1
Teltow	1	0	
Tennessee	1	12	
Typhimurium	12	6	
Virchow	0	1	
Yoruba	2	3	
Rough	1	0	
Untyped	5	4	
Mill environment	Agama	0	8
	Binza	1	0
	Florida	1	0
	Indiana	0	1
	Mbandaka	5	3
	Senftenberg	3	1
	4,12:-:1,5	0	1

Table 75 (continued): The major serotypes of *Salmonella* in feedingstuff ingredients 2005, compared with the previous year

Feedingstuff	<i>Salmonella</i> serotype	Isolations 2004	Isolations 2005
Unspecified	Agama	2	4
	Agona	6	14
	Anatum	4	2
	Binza	1	0
	Bredeney	0	1
	Cubana	1	0
	Derby	0	3
	Dublin	2	1
	Give	1	0
	Goldcoast	0	1
	Good	1	0
	Indiana	1	2
	Infantis	7	1
	Isangi	0	0
	Kedougou	5	2
	Kentucky	2	1
	Kingston	0	2
	Lexington	0	1
	Livingstone	1	1
	Lille	0	1
	Mbandaka	2	2
	Meleagridis	0	1
	Montevideo	0	8
	Ohio	0	2
	Oranienburg	0	1
	Oslo	2	1
	Ouakam	1	0
	Poona	1	0
	Rissen	1	4
	Schwarzengrund	5	0
	Senftenberg	7	4
	Tennessee	5	1
	Thompson	2	1
	Typhimurium	3	2
Wangata	0	1	
Welikade	0	1	
Yoruba	1	1	
Rough	0	1	
Untyped	4	0	

Table 76: Animal By-Products Order 1999 - domestic protein official testing - contamination rates in 2005 compared with the previous year

Sample Type	Batches Tested in 2004			Batches Tested in 2005		
	No	+ve	% +ve	No	+ve	% +ve
Blood meal	0	0	-	3	0	-
Feather meal	0	0	-	37	0	-
Poultry Offal Meal	21	0	-	30	2	6.7
Meat & Bone Meal	10	0	-	18	3	16.7
Greaves	10	0	-	8	0	-
Herring Meal	4	0	-	3	1	33.3
Other Fish Meal	10	0	-	12	0	-
White Fish Meal	9	0	-	5	0	-
Others	86	1	1.2	171	2	1.2
Total	150	1	0.7	287	8	2.8

NB: This table excludes the results of private testing

**Fig 43: Contamination rate - domestic processed animal protein
(official and private testing - batches) 1996 - 2005**

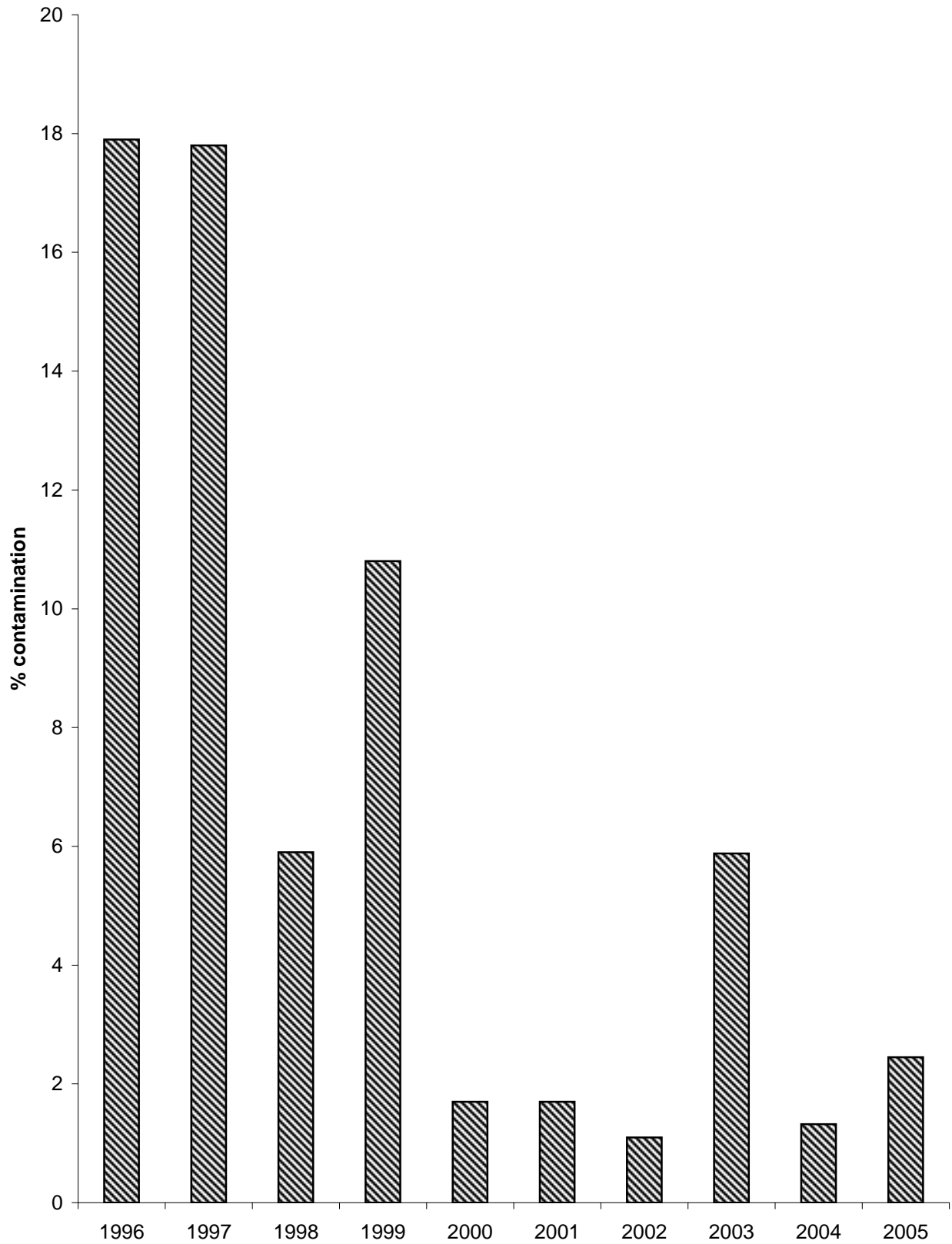


Table 77: Animal By-Products Order 1999 - serotypes isolated during 2005 from official and private testing of domestic protein, compared with previous year

<i>Salmonella</i> serotype	Isolations 2004	<i>Salmonella</i> serotype	Isolations 2005
Schwarzengrund	2	Montevideo	7
Saint Paul	1	Indiana	3
		Schwarzengrund	2
		Anatum	1
Total isolations	3	Total isolations	13
No. of positive batches	2	No. of positive batches	8

Table 78: The Importation of Processed Animal Protein Order, 1981 - imported protein contamination rates in 2005, compared with the previous year

Sample Type	Batches Tested in 2004			Batches Tested in 2005		
	No	+ve	% +ve	No	+ve	% +ve
Bone Meal	1	1	100.0	0	0	-
Meat & Bone Meal	19	2	10.5	4	1	25.0
Fish Meal	62	1	1.6	61	1	1.6
Others	5	0	-	5	0	-
Total	87	4	4.6	70	2	2.9

**Fig 44: Contamination rate: imported processed animal protein
(batches tested) 1996 - 2005**

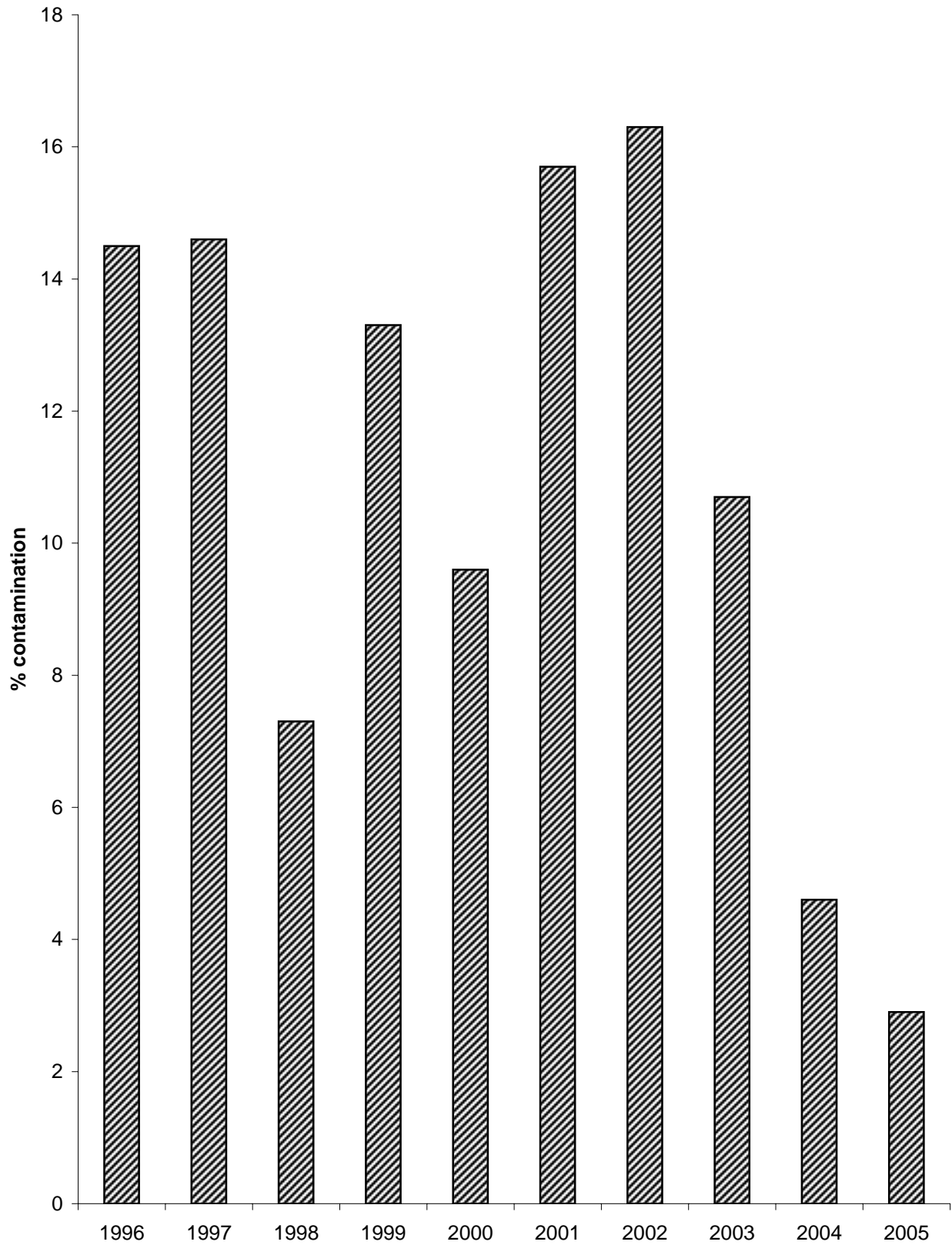


Table 79: The Importation of Processed Animal Protein Order, 1981 - serotypes isolated during 2005 from imported protein, compared with the previous year

<i>Salmonella</i> serotype	Isolations 2004	<i>Salmonella</i> serotype	Isolations 2005
Thompson	5	Anatum	2
Infantis	2	Infantis	2
Poona	1	6,7:-:-	2
Senftenberg	1	Agona	1
		Livingstone	1
Group C	5		
Group G	1		
Total isolations	21	Total isolations	8
No. of positive batches	24	No. of positive batches	2