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# FOOD SAFETY ISSUES

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## **Human listeriosis 1991-1992**



**FOOD SAFETY UNIT  
DIVISION OF FOOD AND NUTRITION  
WORLD HEALTH ORGANIZATION**

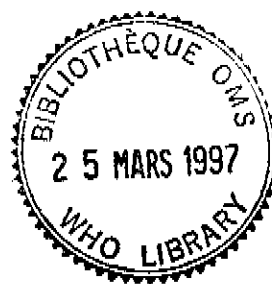
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# HUMAN LISTERIOSIS

1991 - 1992



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## 1. INTRODUCTION

Listeriosis emerged as a new foodborne disease in the early 1980's. It is a severe disease characterized by abortion, meningitis and septicaemia, mainly diagnosed in people with impaired immunity (pregnant women, neonates, the elderly and immunocompromised patients) (*Farber & Peterkin, 1991 ; Schuchat et al., 1991*). The case fatality rate is high (20-30 % of cases) and neurological sequellae are observed in a number of survivors. The background incidence of sporadic cases is low, however foodborne outbreaks, affecting up to 300 patients, have been regularly reported since 1981 (*Anonymous, 1993 ; Bille, 1990 ; Fleming et al., 1985 ; Goulet et al., 1993 ; Goulet et al., 1995 ; Linnan et al., 1988 ; McLauchlin et al., 1991 ; Schlech et al., 1983*). Due to the severity of the disease and the very frequent involvement of industrially processed foods, especially during outbreaks, the social and economic impact of listeriosis is among the highest of the foodborne diseases (*Roberts, 1989 ; Roberts & Pinner, 1990*).

A number of countries have consequently established surveillance systems to evaluate the incidence of the disease, to monitor its occurrence and detect outbreaks as soon as they emerge, to identify populations at risks and to study the role of food in the transmission of the disease.

This report is the update of previous reports (*Rocourt, 1991 ; Rocourt & Brosch, 1992*) forming a regular summary of data on listeriosis in the world. Data were collected by questionnaire sent to microbiologists and/or epidemiologists known to be involved in listeriosis surveillance (or supposed to be in contact with people working in this field). The authors are especially grateful to all participants who accepted to share their data for this document. The data published in the scientific literature for or during this period are also included.

## 2. NUMBER OF REPORTED CASES, INCIDENCE AND CASE-FATALITY RATE

### 2.1. CASE DEFINITION

Patients were categorized either as perinatal or nonperinatal cases :

- A perinatal case is one in which *Listeria monocytogenes* is isolated from a culture of a normally sterile site of a pregnant woman, her neonate or foetus or both ; the mother and neonate or foetus are counted as one case.
- A nonperinatal case is one in which *L. monocytogenes* is isolated from a normally sterile site of someone other than a pregnant woman or a neonate.

This excludes all cases suspected on the basis of serodiagnosis alone.

### 2.2. SURVEILLANCE OF LISTERIOSIS

Most systems used for listeriosis surveillance are passive (Table 1). They include mandatory notification, voluntary notification and laboratory-based systems as previously described (*Rocourt & Brosch, 1992*). Among these methods, those based on laboratory data are the most frequent. None of these passive systems was recently subjected to evaluation during this period and no reply was obtained to questions addressing representativeness and completeness of data.

**Table 1 : Passive surveillance systems for listeriosis**

COUNTRY	MANDATORY NOTIFICATION	VOLUNTARY NOTIFICATION	LABORATORY-BASED
<i>Europe</i>			
Belgium	-	-	+
Czech Rep.	-	+	-
Denmark	meningitis	-	+
Finland	+	-	+
France	-	-	+
Germany	neonatal cases	-	-
Italy	+	-	-
Norway	+	-	+
Spain	-	+	-
Sweden	+	-	-
Switzerland	+	-	+
UK	-	+	+
Yugoslavia	-	-	+
<i>South America</i>			
Argentina	-	-	+
Brazil	-	-	+
<i>Oceania</i>			
Australia	+ in Victoria	-	+ in West. A.
New Zealand	+	-	+
<i>Asia</i>			
Hong Kong	-	-	+
Japan	-	-	+

In the USA, a multistate laboratory-based active surveillance has been in operation since 1986 to estimate the true incidence of the disease (*Gellin et al., 1991*). In 1991, the surveillance area included Los Angeles, San Francisco, counties in Tennessee and Georgia, and the entire state of Oklahoma (more than 20 million people). In 1992, entire states of Missouri and Maryland were added (total surveillance area of 30 million people). Laboratory audits indicate a completeness of data of more than 90 %. The population under surveillance is slightly more urban (overall) than the general population of the USA and overrepresents the prevalence of HIV-infection compared to the USA as a whole.

No specific surveillance systems for listeriosis were reported for some European countries (Cyprus, Greece, Hungary, Malta, The Netherlands, Turkey), some African countries (Algeria, Ethiopia, Ivory Coast, South Africa, Tunisia), the People's Republic of China and the Falkland Islands.

Except for the USA, data presented in this document are likely to underestimate the true incidence and other characteristics of the disease. The true rate of underreporting is not known, however, it could be lower for invasive listeriosis than for other foodborne diseases like diarrhoea because of its severity and the subsequent hospitalization of patients. The information provided by this document should therefore be very cautiously interpreted due to the large differences in the nature and sensitivity of the surveillance systems. Because of the diversity of surveillance systems and the resulting undernotification, comparison of data between countries is impossible. However, assuming that the reporting system in a country has not been changed over the last years, trends can be observed and this may be an indicator of the evolution of the disease in a given country, as it has

been shown for other foodborne diseases (*WHO surveillance programme for control of foodborne infections and intoxications, 1995*).

### 2.3. DATA FOR 1991 AND 1992 AND COMPARISON WITH PREVIOUS YEARS

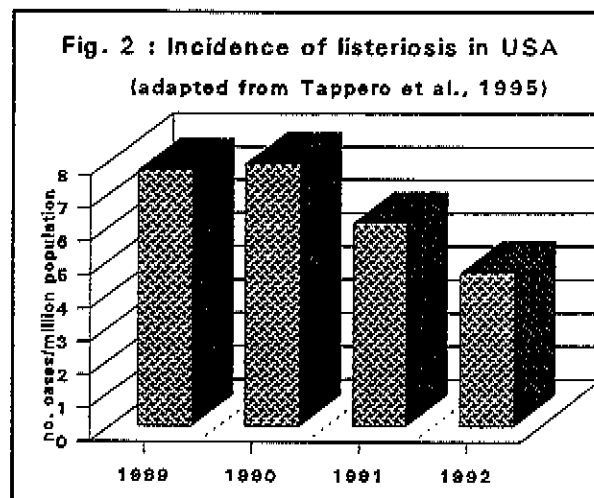
Numbers of cases, incidences and case-fatality rates are reported in Table 2. Incidence estimations are between 0.2 and 6.8 cases per million inhabitants in 1991 and 1992 (the incidence of France in 1992 excepted). No cases were reported in Bulgaria, Cyprus, Malta, Algeria, Ethiopia, Ivory coast, Tunisia, French Guyana and the Falkland Islands. Whether these differences in incidence reflect true geographical differences, differences in food habits and food storage (*L. monocytogenes* is a psychrotrophic bacterium), or differences in diagnosis and/or in reporting practices is not known<sup>1</sup>.

Fig. 1 shows comparisons for previous years with data previously published (*Anonymous, 1995 ; Art & André, 1991 ; Baker & Short, 1991 ; Campbell, 1990 ; Campbell & Chalmers, 1990 and 1991 ; Espaze et al., 1989 and 1990 ; McLaughlin & Newton, 1995 ; Newton et al., 1991 and 1992 ; Rocourt, 1991 ; Rocourt & Brosch, 1992 ; Ronne, 1992 ; Samuelsson et al., 1990*).

In England, Scotland and Wales, after the outbreak associated with the consumption of an imported paté from a single manufacturer in 1987-1989 (*McLaughlin et al., 1991*), the number of cases returned to previous levels (*Campbell & Chalmers, 1991 ; McLaughlin & Newton, 1995*). This decrease was not uniform in the country and varied between the regions (*Newton et al., 1992*). Similar trends were observed in Switzerland after the outbreak of 1983-1987 associated with a soft cheese (*Bille, 1990 ; Anonymous, 1995*) and in Denmark after the outbreak of 1989-1990 associated with a blue cheese (*Gerner-Smidt et al., 1995 ; Jensen et al., 1994*). The number of cases also decreased in Victoria (*Sally, 1991 ; Sally et al., 1993*) and in Barcelona (*Nolla-Sallas et al., 1993 and 1994*) in the same period.

In the USA, a significant decrease in the incidence of listeriosis was also observed, with the incidence falling from 7.7 cases /million population in 1989 to 4.6 cases /million population in 1992 (Fig. 2) (*Tappero et al., 1995*). Geographical differences in incidence were observed : among areas with active surveillance, the incidence ranged from 8.9 cases per million population in San Francisco, California (3 countries, Bay area) to 1.9 cases per million population in the State of Oklahoma in 1991. Based on data for the active surveillance areas, the projected number of cases in the USA were 1,567 and 1,193 for 1991 and 1992 respectively.

In contrast, in France, after a decrease in the number of cases in 1990, followed by a slight increase in 1991, the incidence rose sharply in 1992. This was mainly due to a major outbreak of 279 cases (see paragraph 7.1.2.). During this outbreak, the regular reminders to medical microbiologists of the necessity to send the strains they isolated to the reference laboratory for the detection of epidemic cases is certainly responsible for a better reporting of cases, and consequently for part of the apparent increase in the incidence of sporadic cases.



<sup>1</sup>Listeriosis cases published in 1991 and 1992 in countries not listed in Table 2 are reported in Annex 1

Table 2 : Numbers of cases, incidences and case-fatality rates in 1991 and 1992

COUNTRY	NUMBER OF CASES		INCIDENCE <sup>1</sup>		CASE-FATALITY RATE <sup>2</sup>	
	1991	1992	1991	1992	1991	1992
<i>Europe</i>						
Belgium	26	44	2.5	4.4	23	42
Czech Republic	8	<sup>3</sup>	-	-	25	-
Denmark	32	24	6.4	4.8	22	27
Finland	25	30	5	6	24	23
France	387	737	6.8	13	-	-
Germany	34	30	-	-	-	-
Hungary	10	8	-	-	40	25
Italy	12	11	3.5	3.5	33	18
Norway	9	21	2.1	4.9	-	-
Spain	7	27	-	-	-	-
Sweden	36	-	4.1	-	5	-
Switzerland	21	25	3	3.5	15	-
Turkey	3	3	-	-	-	-
UK	142	122	2.5	2.2	29	31
Yugoslavia	9	-	-	-	78	-
<i>North America</i>						
Guadeloupe	0	3	-	-	-	-
USA <sup>4</sup>	121	138	6.3	4.6	30	26
<i>South America</i>						
Argentina	6	13	-	-	-	46
Brazil	21	28	-	-	38	28
<i>Oceania</i>						
Australia	35	-	5.3	-	28	-
New Caledonia	1	2	-	-	-	-
French Polynesia	0	1	-	-	-	-
New Zealand	20	14	6.1	4	35	-
<i>Asia</i>						
China (People's Republic)	2	0	-	-	-	-
Hong-Kong	13	8	2.2	1.3	6	25
Japan	20	-	0.2	-	30	-
<i>Africa</i>						
Algeria	2	0	-	-	-	-

<sup>1</sup> : per million population

<sup>2</sup> : %

<sup>3</sup> : no information or not applicable

<sup>4</sup> : surveillance areas : in 1991, Los Angeles, San Francisco, counties in Tennessee and Georgia and the entire state of Oklahoma (more than 20 million people) ; in 1992, entire states of Missouri and Maryland were added (total surveillance population 30 million people).

Fig. 1 : Number of cases until 1992

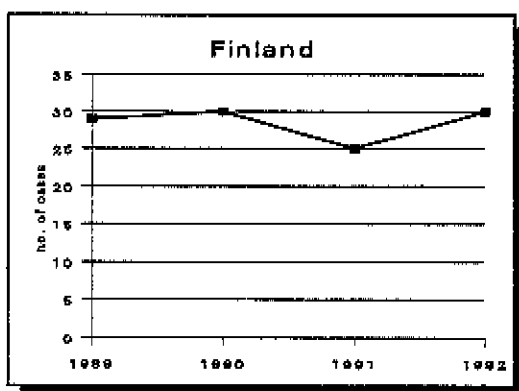
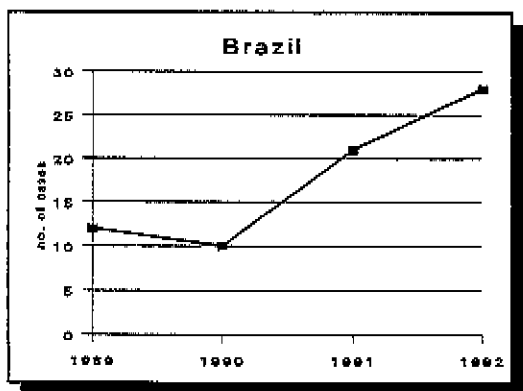
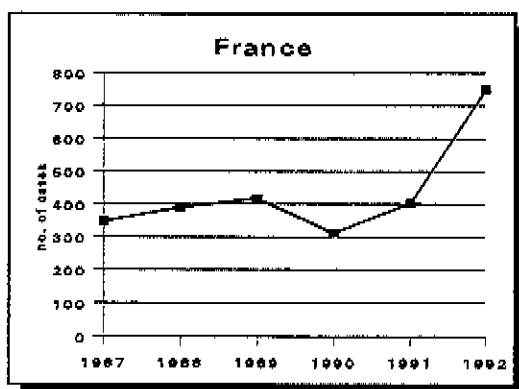
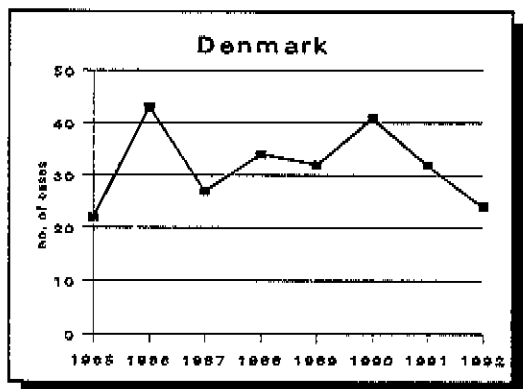
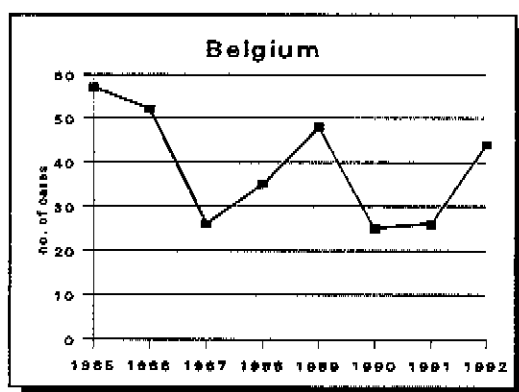
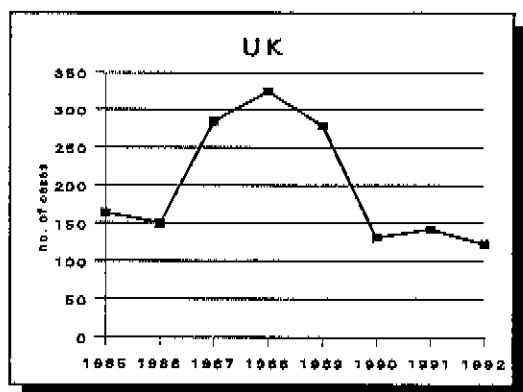
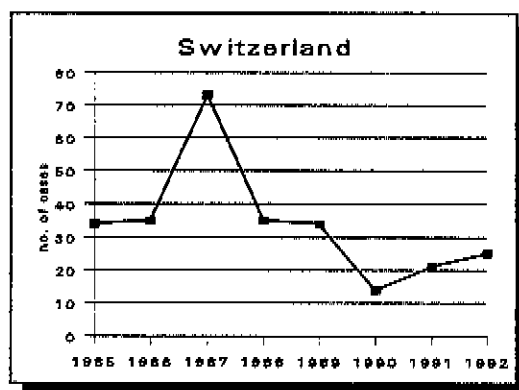
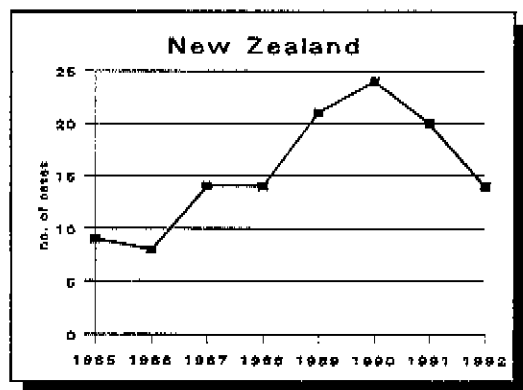


Table 3 : Distribution of perinatal and nonperinatal cases

COUNTRY	NO. OF PERINATAL CASES		NO. OF NONPERINATAL CASES	
	1991	1992	1991	1992
<i>Europe</i>				
Belgium	9	6	17	37
Czech Rep.	3	1	5	-
Denmark	6	2	23	22
Finland	7	5	18	25
France	170	250	216	487
Germany	34	42	3	6
Hungary	3	3	9	7
Italy	2	3	10	9
Norway	2	3	7	18
Spain	2	3	5	27
Sweden	8	-	28	-
Switzerland	3	1	18	23
Turkey	1	2	2	1
UK	38	28	100	93
Yugostavia	5	-	4	-
<i>North America</i>				
Guadeloupe	-	2	-	1
USA	36	37	83	97
<i>South America</i>				
Argentina	3	10	3	3
Brazil	2	1	19	24
<i>Oceania</i>				
Australia	15	-	20	-
New Caledonia	1	2	0	0
French Polynesia	0	1	0	0
New Zealand	15	6	5	8
<i>Asia</i>				
Hong Kong	4	5	9	4
Japan	6	-	14	-

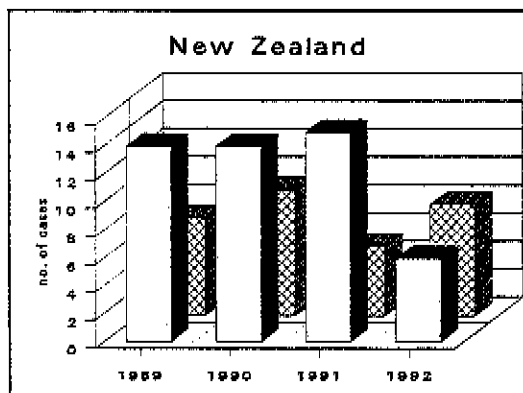
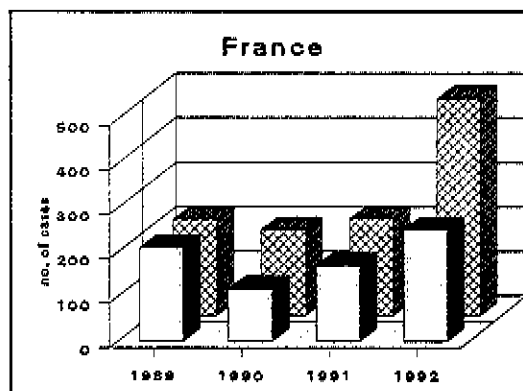
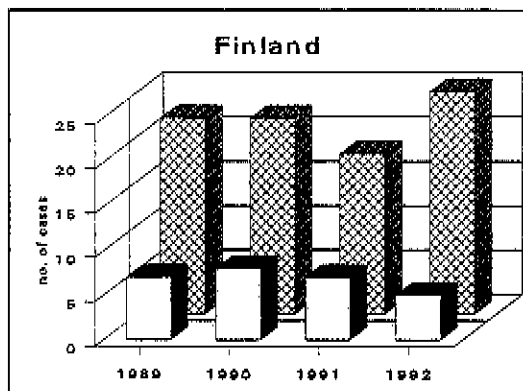
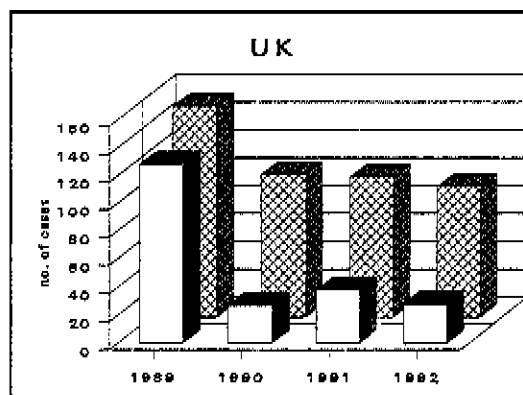
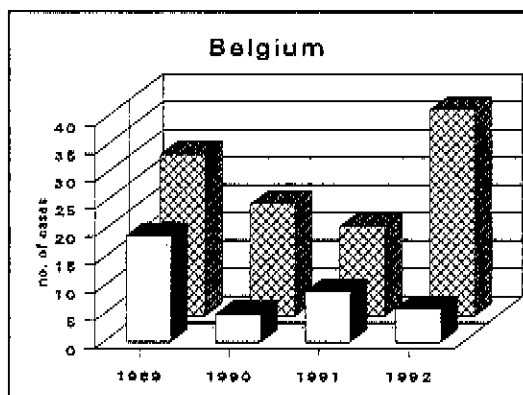
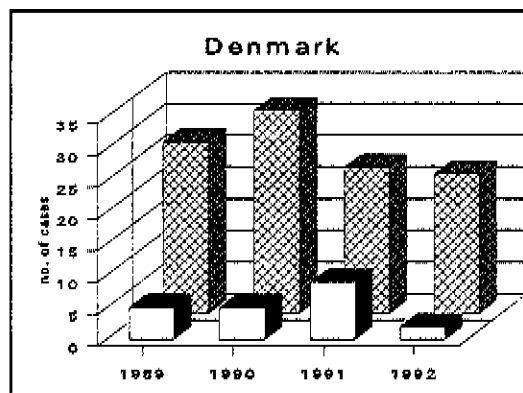
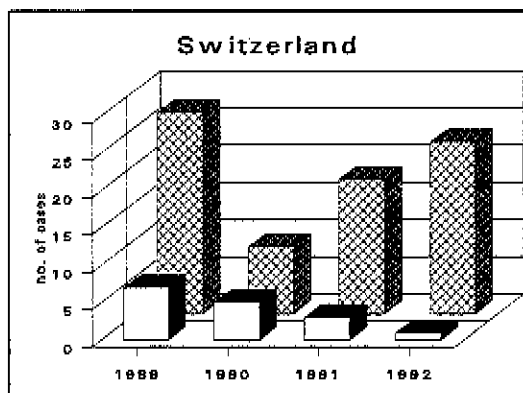
### 3. PERINATAL CASES<sup>1</sup>

A total of 787 cases of perinatal cases were reported in 1991 and 1992. They accounted for 38 % (375 cases) of cases in 1991 and for 31 % (412 cases) in 1992 (Table 3 and Fig. 3 and 4).

There were slight decreases in the numbers of pregnancy-related cases in 1991 and 1992 in Denmark, Switzerland, Finland, Belgium and New Zealand (Fig. 3 and 4). A similar trend was observed in France between 1990 and 1991. Whether these changes are due to changes in surveillance methods, to improved medical and public awareness of the disease, to a modification

<sup>1</sup>Information on perinatal listeriosis published in 1991 and 1992 is reported in Annex 1.

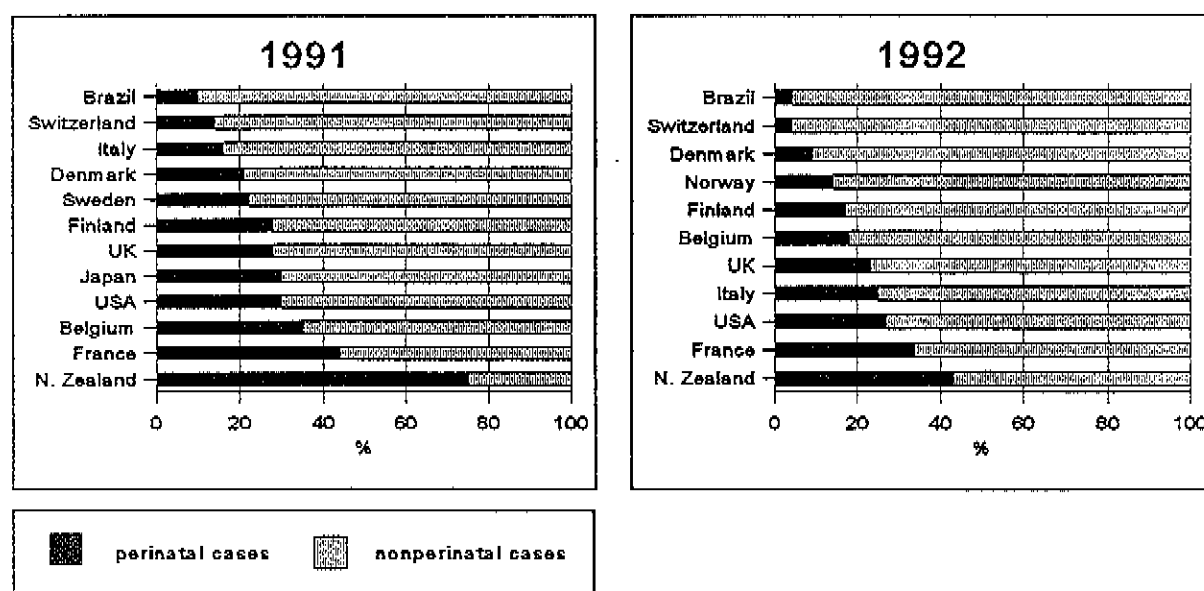
Fig. 3 : Evolution of the number of perinatal and nonperinatal cases between 1989 and 1992



of diet in response to specific advice to populations at risk and particularly to pregnant women, or to demographic changes with an increase of immunocompromized people, is unknown.

Perinatal listeriosis is rarely life-threatening to the mother, but neonatal morbidity and mortality is high. One hundred and eighty-eight cases of neonatal listeriosis (14 countries) were reported with the date of onset. The early onset form (which usually occurs in infants infected *in utero*, with manifestations apparent within a few hours or days after birth) was more frequent (139 cases = 74 %) than the late onset form (generally full-term infants healthy at birth who suffer from listeriosis several days after birth) (49 cases = 26 %). The case-fatality rate of neonatal listeriosis was 30 % (31/102 cases) for early onset and 11 % for late onset (3/28 cases). Overall lethality for neonates was 26 %. These observations corroborate previously published data (Cherubin *et al.*, 1991).

Fig. 4 : Annual percentages of perinatal and nonperinatal cases



#### 4. NONPERINATAL CASES

##### 4.1. CLINICAL MANIFESTATIONS<sup>1</sup>

Clinical forms were reported for 1,479 nonperinatal cases in 1991 and 1992 (Table 4) and included:

- bacteriemia/septicaemia : 835 cases (56 %)
- infections of the central nervous system (meningitis, meningo-encephalitis, and less frequently encephalitis, brainstem and spinal cord abscess) : 528 cases (36 %)
- atypical forms : 116 cases (8 %)

<sup>1</sup>: Information on central nervous system infections and atypical clinical forms published in 1991 and 1992 is reported in Annex 1.

Interestingly, while human listeriosis is nearly always caused by *L. monocytogenes*, *L. ivanovii* was isolated from blood of a patient with AIDS in 1992 in UK (Cummins *et al.*, 1994). A very rare catalase negative strain of *L. monocytogenes* caused meningitis in a previously healthy adult (Swartz *et al.*, 1991).

**Table 4 : Clinical manifestations and predisposing conditions of nonperinatal cases**

COUNTRY	1991				1992			
	CLINICAL MANIFESTATIONS CNSI <sup>1</sup>	B./S. <sup>2</sup>	Others	% OF CASES WITH PC <sup>3</sup>	CLINICAL MANIFESTATIONS CNSI	B./S.	Others	% OF CASES WITH PC
<i>Europe</i>								
Belgium	6	10	1	56	10	24	3	31
Czech Rep.	2	0	3	- <sup>4</sup>	-	-	-	-
Denmark	8	14	1	52	9	13	0	50
Finland	4	14	0	61	6	16	3	72
France	86	110	19	-	187	264	16	-
Hungary	5	4	0	-	2	1	4	57
Italy	6	4	0	-	4	5	0	78
Norway	1	5	1	-	7	10	1	66
Spain	1	1	3	-	8	17	2	-
Sweden	7	19	2	43	-	-	-	-
Switzerland	6	11	1	75	5	16	2	-
Turkey	1	1	0	-	1	0	0	-
UK	28	40	32	45	21	70	2	67
Yugoslavia	2	2	0	-	-	-	-	-
<i>North America</i>								
Guadeloupe	0	0	0	-	1	0	0	-
USA	26	53	4	-	27	62	8	-
<i>South America</i>								
Argentina	1	2	0	-	1	2	0	-
Brazil	15	3	1	-	12	10	2	-
<i>Oceania</i>								
Australia	5	12	3	63	-	-	-	-
New Zealand	2	0	0	-	1	7	0	-
<i>Asia</i>								
China (People's Rep.)	0	1	1	-	-	-	-	-
Hong Kong	0	9	0	-	1	3	0	-
Japan	13	0	1	-	-	-	-	-

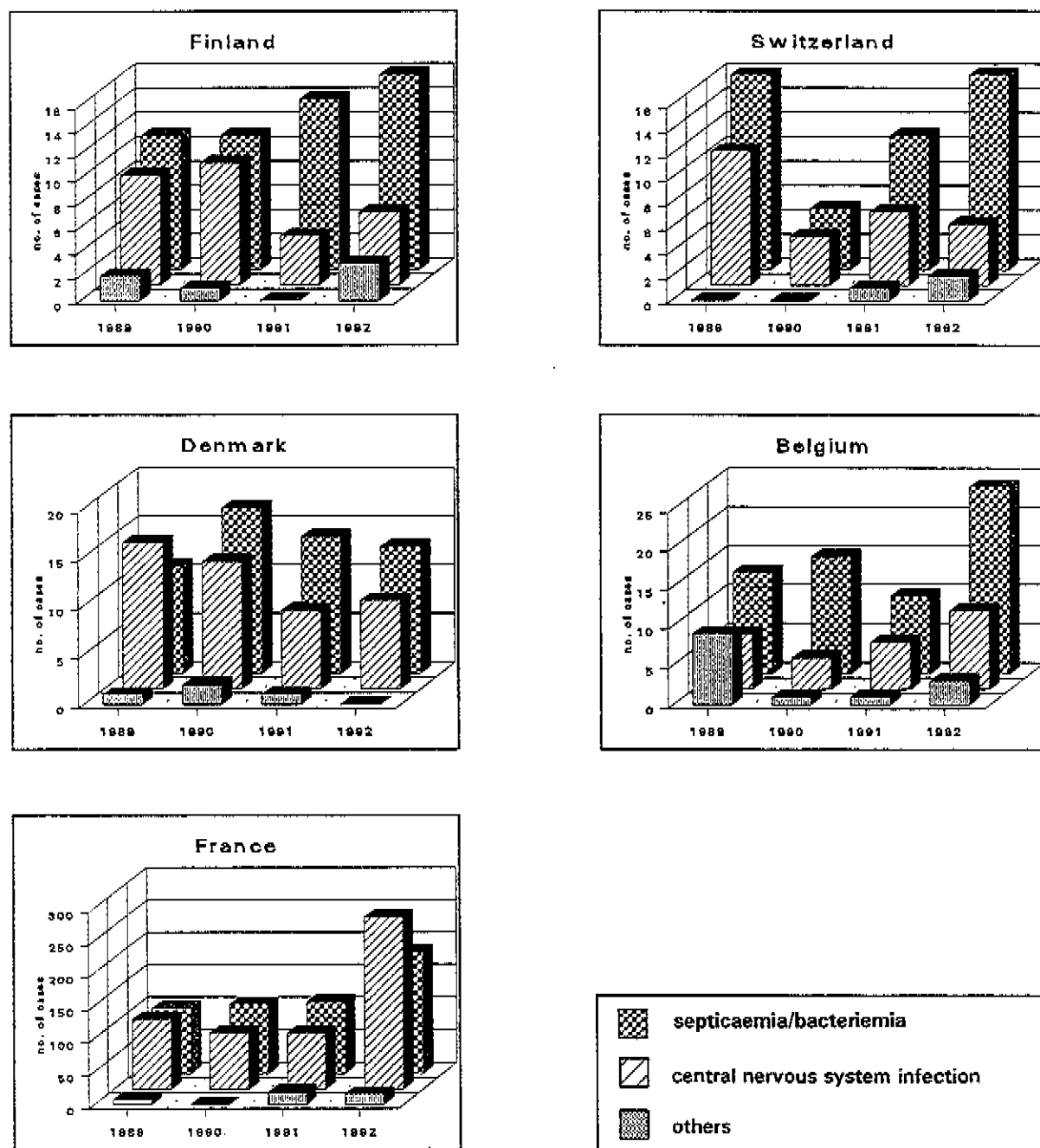
<sup>1</sup> : central nervous system infection ; <sup>2</sup> : bacteriemia/septicaemia ; <sup>3</sup> : predisposing conditions ; <sup>4</sup> : no information

Bacteremia (and septicaemia) and central nervous system infections were the most common clinical entities. Data from the literature indicate that the most common form of listeriosis in immunosuppressed patients was bacteremia and the predominant form affecting previously healthy patients was infection of the central nervous system (*Marchetti et al., 1995 ; Skogberg et al., 1992*).

The most common atypical clinical forms reported included peritonitis (and positive ascites) (23 cases), various abscesses (10 cases), arthritis (and osteomyelitis) (6 cases), endocarditis (4 cases) and endophthalmitis (2 cases).

Comparison of the distribution of various clinical forms in 1991 and 1992 with those of previous years does not clearly indicate whether any one of the clinical presentations is consistently more frequent than the others (Fig. 5).

Fig. 5 : Clinical forms of nonperinatal cases between 1989 and 1992



#### 4.2. UNDERLYING DISEASES

It is well established that listeriosis occurs most often in persons with underlying disease or in the elderly ; there are, however, instances in which apparently healthy individuals have become ill with listeriosis in both foodborne outbreaks and sporadic cases. Thirty-one to 78 % of patients were reported to suffer from an underlying disease prior their infection (Table 4). Differences concerning underlying diseases are difficult to analyse, especially because they could reflect differences in reporting practices.<sup>1</sup>

Two hundred and ninety-two cases with underlying disease were reported. They included :

- malignancy (solid tumour) : 97 cases (33 %)
- lymphoma, sarcoma, leukaemia : 61 cases (21 %)
- organ transplantation : 37 cases (13 %)
- chronic hepatic disease : 31 cases (11 %)
- diabetes : 23 cases (8 %)
- AIDS : 22 cases (8 %)
- collagen and vascular diseases : 8 cases (8 %)
- others : 13 cases (4 %)

#### 4.3. AGE, SEX AND CASE-FATALITY RATES

##### *age*

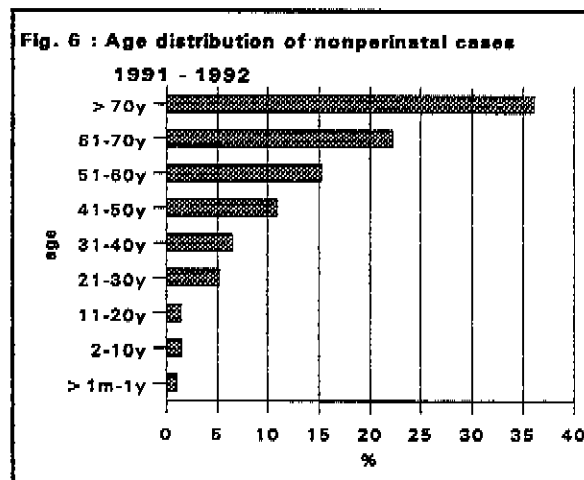
Age was reported for 1,330 cases in 1991 and 1992. The distribution according to age is described in Table 5 and Fig. 6.

- > 1 month - 1 year : 14 cases (1 %)
- 2 - 10 years : 20 cases (1.5%)
- 11 - 20 years : 18 cases ( 1.4%)
- 21 - 30 years : 69 cases ( 5.2 %)
- 31 - 40 years : 86 cases (6.5 %)
- 41 - 50 years : 145 cases (10.9 %)
- 51 - 60 years : 202 cases (15.2 %)
- 61 - 70 years : 296 cases (22.2 %)
- > 70 years : 480 cases (36.1 %)

The increasing incidence with age may reflect the decline of the immune system, or the increasing prevalence of immunosuppressive disorders, or use of medication in elderly persons, or all three.

##### *sex*

The sex of 1,360 cases was reported (Table 5 and Fig. 7) : male, 813 cases (60 %) and female, 547 cases (40 %). Thus the incidence of non-pregnancy associated cases was higher among men than women (sex ratio = 1.5) which is similar to previous observations. Sex ratios calculated for each country with available data were between 1 and 3.2.



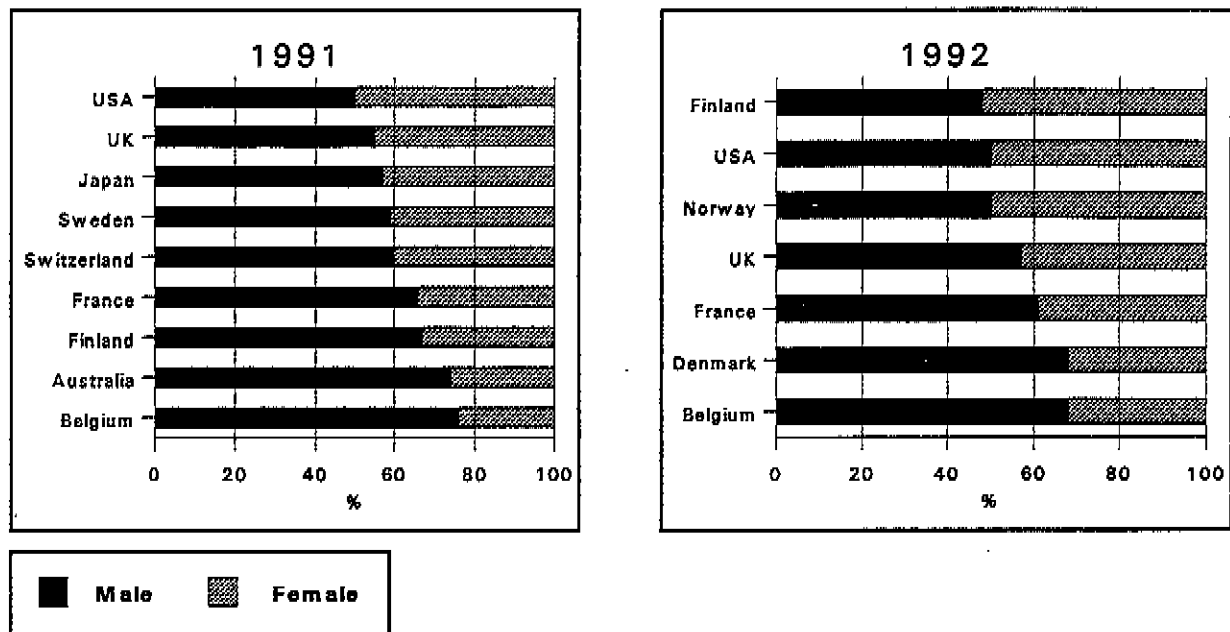
<sup>1</sup>Information on underlying diseases published in 1991 and 1992 is reported in Annex 1

Table 5 : Age, number of deaths, and sex of nonperinatal cases

COUNTRY and YEAR	AGE										SEX		
	> 40 y.		41-50 y.		51-60 y.		61 - 70 y.		> 70 y.		M	F	
	no. cases	no. deaths	no. cases	no. deaths	no. cases	no. deaths	no. cases	no. deaths	no. cases	no. deaths	no. cases		
<i>Europe</i>													
Belgium	1991	2	0	0	0	3	1	3	2	8	2	13	4
	1992	3	0	3	0	9	0	7	1	13	2	26	12
Czech R.	1991	3	0	0	0	0	0	1	0	1	0	3	2
Denmark	1991	4	0	4	0	3	1	5	1	7	3	1	-
	1992	3	1	2	1	4	1	6	2	7	1	15	7
Finland	1991	6	0	1	0	4	1	4	0	3	3	12	6
	1992	3	1	2	0	6	3	5	1	9	2	12	13
France	1991	27	-	30	-	31	-	44	-	80	-	142	74
	1992	39	-	39	-	69	-	130	-	162	-	299	188
Hungary	1991	0	0	0	0	1	0	2	1	0	0	2	1
	1992	1	0	0	0	1	0	0	0	1	0	1	2
Italy	1991	1	0	1	1	4	1	4	2	0	0	9	1
	1992	4	0	1	0	0	0	2	1	1	1	-	-
Norway	1991	0	0	0	0	0	0	2	1	5	2	2	4
	1992	1	-	2	-	4	-	2	-	9	-	9	9
Sweden	1991	4	-	3	-	2	-	8	-	12	-	17	12
Switzerl.	1991	8	1	1	0	3	1	0	0	4	1	12	8
	1992	3	-	1	-	3	-	2	-	3	-	-	-
UK	1991	11	0	11	3	17	5	14	7	41	15	52	42
	1992	7	1	13	1	16	2	15	2	33	12	52	40
<i>N. America</i>													
USA	1991	35	5	12	2	4	0	15	5	27	10	47	46
	1992	21	1	14	2	10	6	13	5	40	15	50	50
<i>S. America</i>													
Argentina	1991	1	0	0	0	1	0	1	0	1	0	3	1
	1992	2	0	1	0	0	0	0	0	0	0	1	2
<i>Oceania</i>													
Australia	1991	5	-	0	0	1	-	3	-	9	-	14	5
N. Zealand	1991	2	0	2	0	1	0	0	0	0	0	4	1
	1992	1	-	1	-	2	-	2	-	2	-	6	2
<i>Asia</i>													
Hong Kong	1991	3	1	1	0	0	0	1	0	0	0	1	4
	1992	2	0	0	0	1	0	1	1	0	0	1	5
Japan	1991	5	0	0	0	2	0	4	3	2	1	8	6

1 : no information

**Fig. 7 : Sex distribution of nonperinatal cases in 1991 and 1992 cases**



#### **sex and age**

Both sex and age were reported for 1,274 cases. Male-to-female sex ratios were as follows :

- > 40 years : 1
- 41 - 50 years : 2
- 51 - 60 years : 2.3
- 61 - 70 years : 2.3
- > 70 years : 1

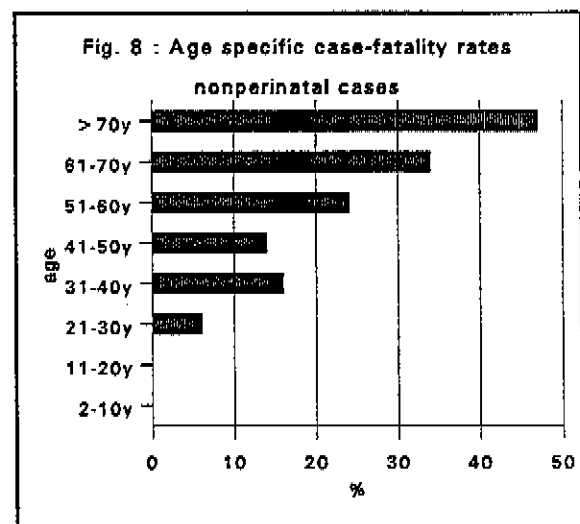
Male-to-female ratios increased with age except for patients over 70 years.

#### **case-fatality rates**

Age-specific case-fatality rates for the 510 cases reported with this information were as follows (Table 5 and Fig. 8) :

- > 1 month - 1 year : 1/7 cases
- 2 - 10 years : 0/8 cases
- 11 - 20 years : 0/3 cases
- 21 - 30 years : 2/33 cases (6 %)
- 31 - 40 years : 8/49 cases (16 %)
- 41 - 50 years : 10/69 cases (14 %)
- 51 - 60 years : 22/90 cases (24 %)
- 61 - 70 years : 35/103 cases (34 %)
- > 70 years : 70/148 cases (47 %)

The overall case-fatality rate for nonperinatal cases was 29 %. Rates increased with age, the highest rates being observed in the elderly. It is not known whether patients died from the *Listeria* infection or whether the infection was a contributory cause to death from an underlying condition.



## 5. TIME DISTRIBUTION

An increase in the number of cases was observed during the third trimester of 1991 and 1992 in Belgium, Denmark, Finland, Switzerland and the UK. There was a similar trend in Brazil during the second trimester. No clear seasonality was observed in New Zealand (Table 6 and Fig. 9).

The significance of these peaks is unknown. They may be due to climatic conditions which could favor *Listeria* growth during inappropriate food storage. They could also be similar to the outbreak observed in 1987 in Philadelphia (*Schwartz et al., 1989*). During this outbreak, the investigators suggested that increases in the number of cases in a community that are not related to a specific food product may reflect increased intestinal susceptibility to *Listeria* infections, possibly because of concurrent viral enteritis.

## 6. SEROGROUPS OF *Listeria monocytogenes* STRAINS

Data for 1991 and 1992 were the following (Table 7 and figures 10 and 11) :

<u>1991</u>	serogroup 1/2 : 348 cases (45 %)	<u>1992</u>	serogroup 1/2 : 483 cases (43 %)
	serogroup 4 : 398 cases (51 %)		serogroup 4 : 613 cases (54 %)
	rare serovars : 28 cases (4 %)		rare serovars : 35 cases (3 %)

Between 1991 and 1992, the number of cases caused by strains of serogroup 1/2 increased as compared to the number of cases caused by strains of serogroup 4. This difference is significantly increased if French cases in 1992 are excluded because of the outbreak caused by a strain serovar 4b. This increase between 1991 and 1992 was observed in a number of countries, including Switzerland, Belgium, Denmark and the USA.

Interestingly, analysis of listeriosis in HIV-infected persons in Los Angeles County between 1985 and 1992 showed that, excluding cases associated with the outbreak of 1985, a higher proportion of HIV-infected persons [11 (65 %) of 17] were infected with a strain of serovar 1/2b than other people with listeriosis [64 (31 %) of 208]. This observation has not yet been explained (*Ewert et al., 1995*).

**Fig. 10 : Percentages of cases caused by strains of serogroups 1/2 and 4 in 1991 and 1992**

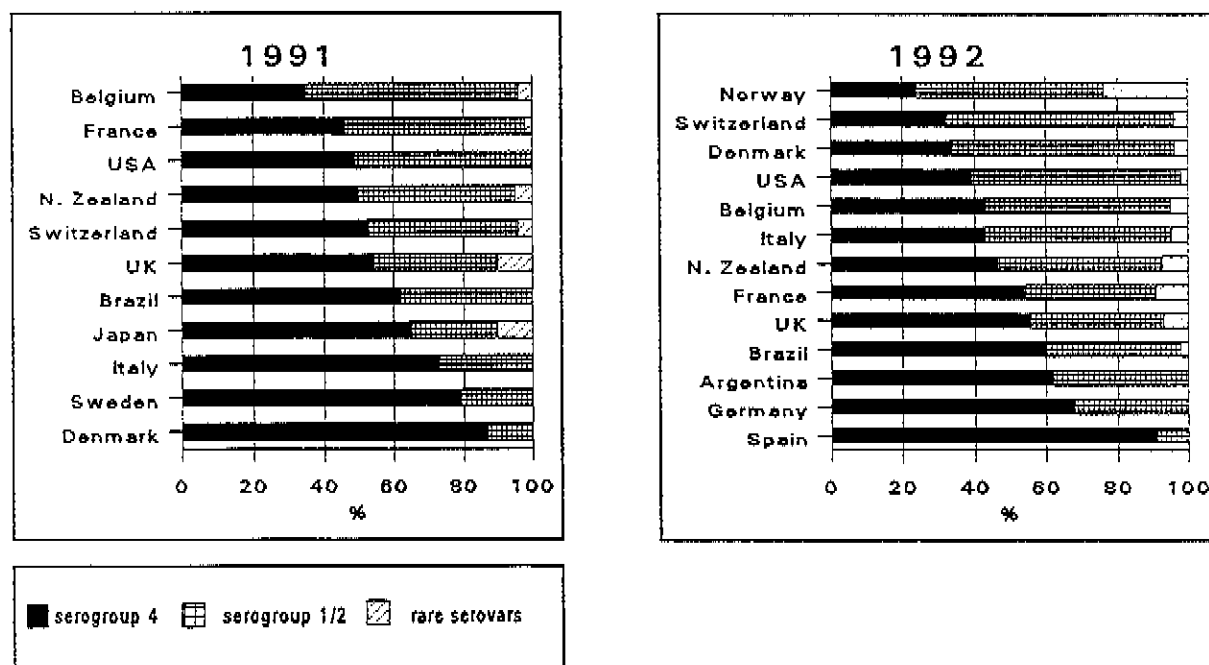


Table 6 : Distribution of cases by month of onset

COUNTRY	YEAR	NO. OF CASES / MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
<i>Europe</i>													
Belgium	1991	5	2	4	0	4	1	1	4	2	2	0	1
	1992	2	2	3	1	1	4	8	2	5	6	5	5
Denmark	1991	3	1	0	0	4	2	5	3	4	5	2	3
	1992	1	0	1	1	1	4	6	2	0	3	1	4
Finland	1991	0	0	2	2	1	2	3	4	4	3	4	0
	1992	1	2	0	0	2	2	7	8	2	4	1	1
France	1991	39	30	34	39	31	30	45	31	32	27	16	19
	1992	38	20	40	67	94	89	98	105	85	44	31	34
Italy	1991	1	0	3	1	2	2	0	0	1	2	0	0
	1991	1	2	0	0	2	2	1	0	2	1	0	0
Norway	1991	2	1	0	1	1	0	2	0	0	1	0	1
	1992	0	1	1	3	2	2	3	4	3	0	0	2
Sweden	1991	4	3	2	1	3	4	2	5	4	4	2	2
Switzerland	1991	1	0	1	3	3	0	4	1	3	0	4	1
	1992	2	0	1	0	1	1	5	4	3	4	0	4
Turkey	1991	1	0	0	0	1	0	0	0	1	0	0	0
	1992	0	1	0	0	1	0	0	0	1	0	0	0
UK	1991	10	9	7	12	16	8	14	13	20	13	11	9
	1992	12	5	6	4	13	12	19	15	12	5	9	8
<i>North America</i>													
USA	1991	7	4	8	9	12	11	10	13	13	9	17	8
	1992	7	7	12	17	13	19	12	13	16	14	5	3
<i>South America</i>													
Argentina	1991	0	0	0	0	1	1	0	0	1	0	3	0
	1992	0	2	2	0	1	0	1	0	6	0	0	1
Brazil	1991	0	2	1	2	6	2	6	1	0	1	0	0
	1992	0	3	0	6	8	6	0	3	0	1	0	1
<i>Oceania</i>													
Australia	1991	3	4	3	2	3	4	0	3	5	6	2	3
N. Zealand	1991	4	4	1	1	2	1	3	0	1	1	2	0
	1992	1	2	0	2	0	0	1	0	2	2	1	3
<i>Asia</i>													
Hong Kong	1991	0	0	0	1	1	2	0	1	2	5	1	0
	1992	0	0	1	1	1	0	0	1	2	1	1	0
Japan	1991	1	2	0	2	4	6	0	3	1	1	0	0

Figure 9 : Distribution of cases by trimester of onset

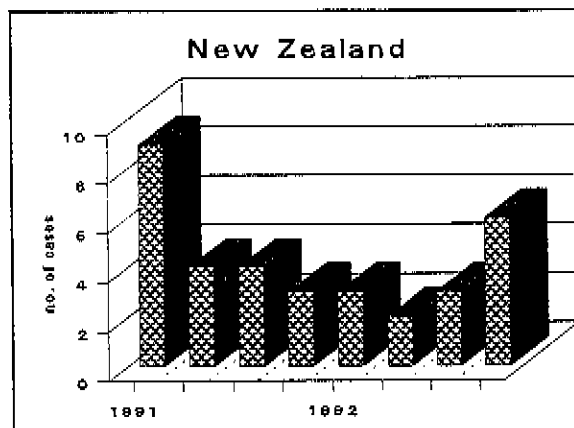
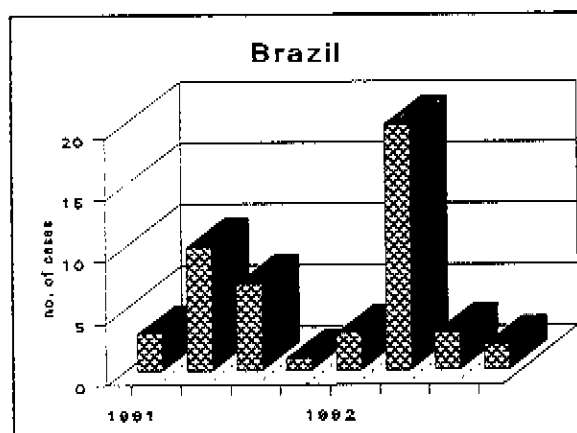
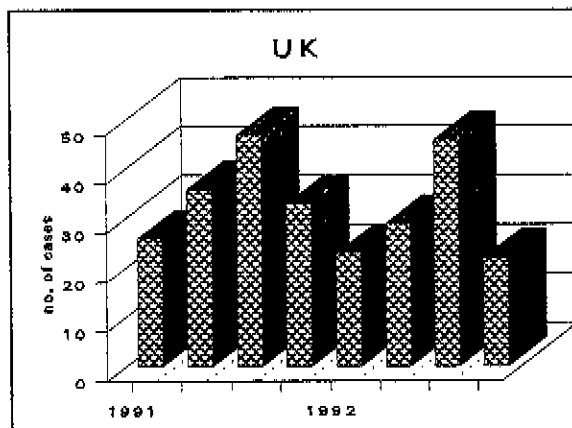
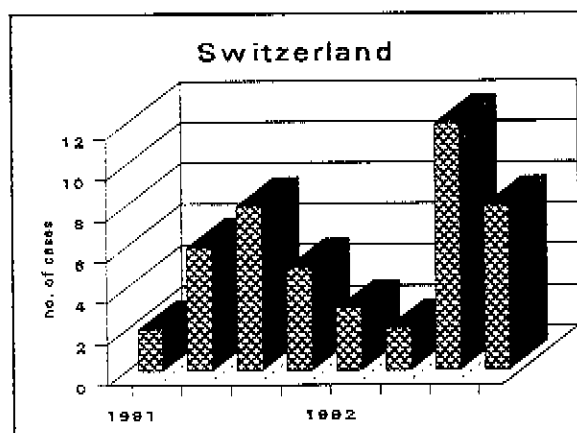
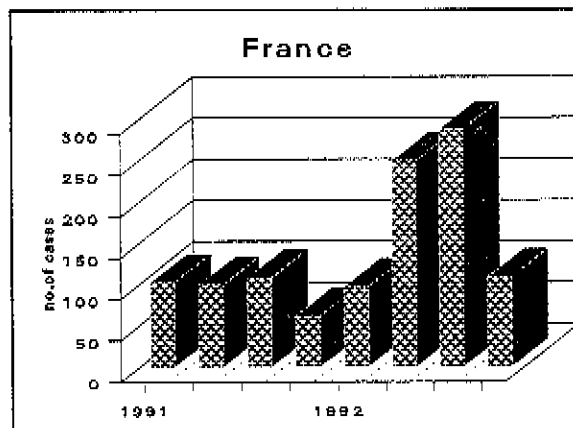
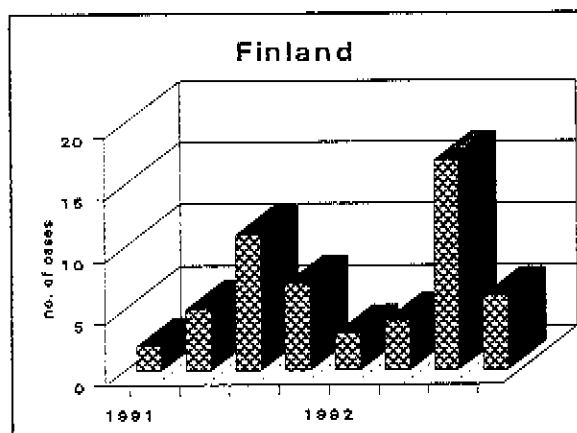
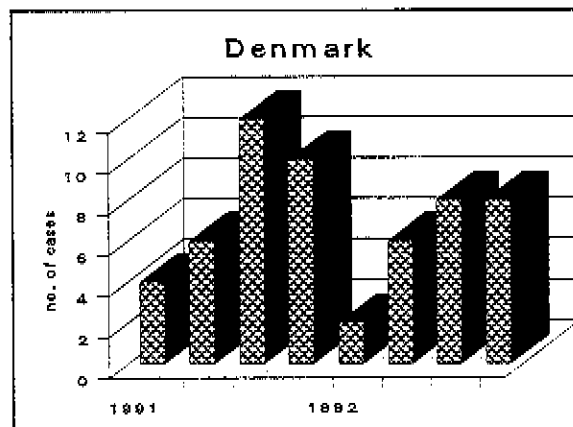
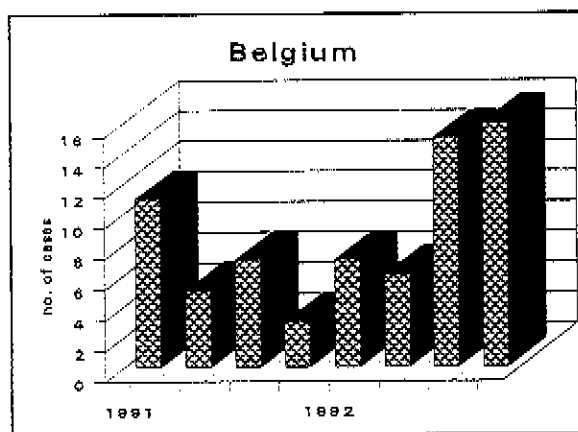


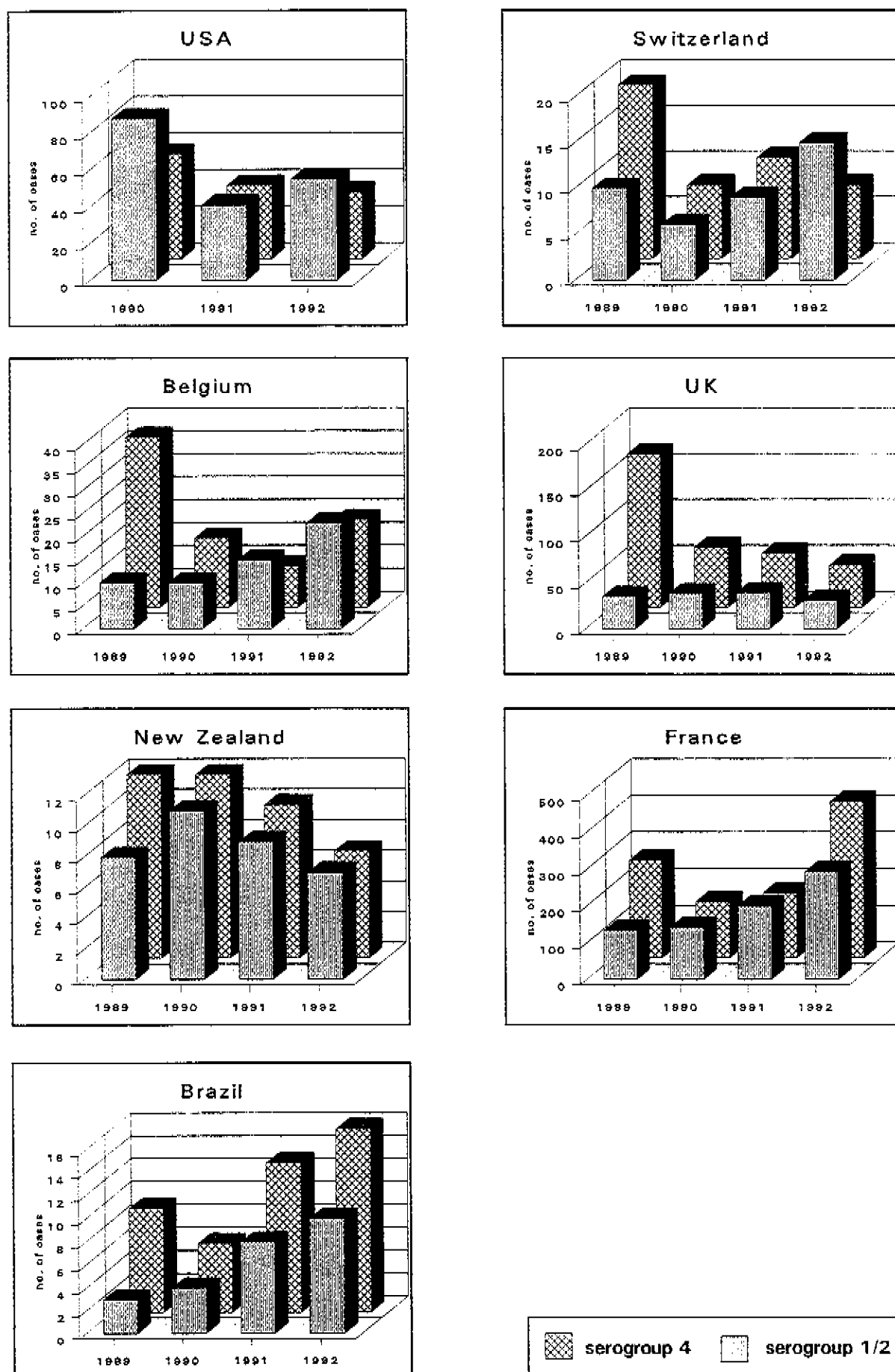
Table 7 : Antigenic characteristics of human *Listeria monocytogenes* strains in 1991 and 1992

COUNTRY	NO. OF STRAINS / SEROVAR							
	1991				1992			
	1/2a	1/2b	4b	others	1/2a	1/2b	4b	others
<b>Europe</b>								
Belgium	9	7	9	1	14	9	19	2
Denmark <sup>1</sup>	.....4.....		28	0	.....15.....		8	
France	111	89	178	9	198	96	426	16
Germany	2	-	-	-	7	0	15	0
Italy <sup>1</sup>	.....3.....		9	0	.....6.....		5	0
Norway	3	0	3	3	11	0	5	5
Spain	-	-	-	-	.....1.....		10	0
Sweden <sup>1</sup>	.....3.....		11	0	-	-	-	-
Switzerland	5	4	11	1	10	6	8	1
Turkey	0	0	2	1	1	-	2	0
UK	20	19	59	10	12	19	46	7
Yugoslavia	2	0	7	0	-	-	-	-
<b>North America</b>								
Guadeloupe	0	0	0	0	0	1	2	0
USA	19	22	40	0	16	39	36	2
<b>South America</b>								
Argentina <sup>1</sup>	.....1.....		3	0	.....5.....		8	-
Brazil	7	1	13	0	10	0	16	2
<b>Oceania</b>								
Australia <sup>1</sup>	.....5.....		2	0	-	-	-	-
New Caledonia	0	1	0	0	-	-	-	-
New Zealand	3	6	10	1	6	1	7	0
<b>Asia</b>								
Japan	4	1	13	2	-	-	-	-

1 : determination of serogroups 1/2 and 4

2 : no information

Fig. 11 : Serogroups of human isolates from 1989 to 1992



## 7. TRANSMISSION OF LISTERIOSIS

(observed in 1991 - 1992 and/or published in 1991 - 1992)

### 7.1. FOODBORNE TRANSMISSION

#### 7.1.1. sporadic cases

*USA - case-control study* (adapted from *Pinner et al., 1992* and *Schuchat et al., 1992*)<sup>1</sup>

A case-control study to identify dietary risk factors for sporadic cases was conducted by the CDC (Centers for Disease Control) in the multistate population of 18 million under active surveillance (four counties in California, four counties in Tennessee, eight counties in Georgia, and the entire state of Oklahoma) between November 1, 1988 and December 31, 1990. One hundred and sixty-five patients with culture-confirmed listeriosis and 376 controls matched for age, health care provider, and immunosuppression were enrolled.

Cases were more likely than matched controls to have eaten soft cheeses [odds ratio (OR), 2.6 ; 95 % confidence interval (CI), 1.4 to 4.8 ;  $p = .002$ ] or food purchased from store delicatessen counters (OR, 1.6 ; CI, 1 to 2.5;  $p = .04$ ) ; 32 % of sporadic cases could be attributed to eating these foods. Sixty-nine percent of affected men and nonpregnant women were cancer patients, persons with AIDS, organ transplant recipients, or patients receiving corticosteroid therapy. Among the immunosuppressed patients, eating undercooked chicken also increased the risk of listeriosis (OR, 3.3 ; CI, 1.2 to 9.2 ;  $p = .02$ ).

A microbiological survey of foods collected from patients' refrigerators was undertaken to evaluate the role of foods in sporadic listeriosis. Patient and food *L. monocytogenes* isolates were subtyped (serotyping and multilocus enzyme electrophoresis) to identify foods contaminated with the strain of *L. monocytogenes* that caused illness in the patient ; samples of these foods were obtained from the retail source. *L. monocytogenes* grew from at least one food specimen in the refrigerator of 79 (64 %) of 123 listeriosis patients ; 11 % of more than 2,000 food specimens collected in the study contained *L. monocytogenes*. Twenty-six (33 %) of 79 refrigerators with food that grew *L. monocytogenes* contained at least one food isolate of the same strain as that in the corresponding patient, a frequency much higher than would be expected by chance ( $p < 0.001$ ). Multivariate analysis showed that foods that were ready-to-eat, foods positive for *L. monocytogenes* by a direct-plating method (a measure of level of contamination), and foods that contained serotype 4b isolates were independently associated with an increased likelihood of containing the same strain as the patient.

In conclusion, foodborne transmission may account for a substantial portion of sporadic listeriosis.

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<sup>1</sup>Gastrointestinal carriage of *L. monocytogenes* in household contacts of patients with listeriosis (adapted from *Schuchat et al., 1993*). During the multistate active surveillance project on sporadic cases, the carriage of *L. monocytogenes* was evaluated among household contacts of patients with invasive listeriosis between January 1990 and December 1991. *L. monocytogenes* was isolated from 17 (21 %) of 82 individuals ; 6 households (21 %) included at least one carrier. Fifteen household contacts (18 %) carried *L. monocytogenes* strains with the same serovar and isoenzyme profile as the corresponding case. Carriage rates did not differ significantly by sex, but was significantly higher in younger persons. There was no significant difference in the presence of gastrointestinal or other symptoms between carriers and noncarriers. These findings suggest that gastrointestinal carriage of pathogenic strains of *L. monocytogenes* is not uncommon in contact cases, underscoring the major role that host susceptibility plays in determining whether illness occurs following exposure or not.

**UK - case-control study** (adapted from Hall et al., 1995)

A national case-control study was initiated by the PHLS (Public Health Laboratory Service, UK) between July 1990 and January 1992. Cases were recruited through the national voluntary laboratory reporting system and PHLS *Listeria* Reference Unit. Controls matched for age, sex, underlying illness and pregnancy status were enrolled by case physicians. Data on food consumption and other exposures in the four weeks before the onset of the case's illness were collected by questionnaire interview. One hundred and twenty four cases (39 perinatal and 85 nonperinatal cases) and 459 controls were interviewed. Because there were statistical interactions between exposures and pregnancy status, the two groups were analysed separately. In univariate analysis of the non-pregnancy associated group, significant risk factors were eating outside the home and eating ready-cooked chicken consumed cold ; for the pregnancy-associated subjects, they were ready-cooked chicken eaten hot, shellfish products and underdone chicken. On multivariate analysis, eating out, ready cooked chicken eaten hot and shellfish remained independently significant. "Eater" cases were significantly more likely to report meals including poultry. Crustaceans and mussels in particular were more often eaten by cases.

**Denmark - case-control study** (adapted from Jensen et al., 1994)

The goals of this study were to identify i) dietary risk factors and ii) risk levels according to particular underlying diseases. Between January 1989 and December 1991, all laboratory reported Danish cases and matching controls were asked to attend a consecutive, open questionnaire study. Questionnaires from 50 patients and 40 controls were analysed. Risk foods for sporadic cases were unpasteurized milk and paté. Malignant haematological and lymphatic tissues diseases, AIDS included, and renal transplantation were the highest risks, > 1,000 fold the risk in healthy patients

**France**

An 86-year-old woman died from *Listeria* meningitis on January 1992. The patient ate a small piece of soft cheese everyday at breakfast until she was hospitalized. A piece of this cheese from the patient's refrigerator and a sample of the same brand obtained from the retailer yielded *L. monocytogenes* at levels of around 100 colony-forming units (cfu)/g. The patient strain, these two cheese strains and four isolates collected in December 1991 and January 1992 during routine controls at the production plant, belonged to the same serovar (1/2a), the same phagovar and the same pulsotypes. The isolation of indistinguishable strains from these different sources is strong evidence that this cheese was responsible for the infection of this patient. This observation indicates that small numbers of *Listeria* (~ 100 cfu/g), possibly in association with a repeated ingestion, could lead to an invasive infection.

**7.1.2. outbreaks****Australia - Paté** (adapted from Kittson, 1992)

During the period March 1990 through August 1990, nine women attending a large maternity hospital in Perth (Western Australia) presented spontaneous abortion, mid-trimester miscarriage or premature labor. Of the 11 fetuses or infants affected, which included two sets of twins, there were six deaths. Patients were given informal interviews by attending physicians to ascertain food histories. A sample of paté from a patient's refrigerator, along with other foods deemed at high risk, was obtained. In the investigations of food samples, ten-flavour varieties of paté "x" were analyzed representing eight different days of production. Among 35 samples tested, 11 (31 %) samples were positive for *L. monocytogenes*. The sample paté "x" from a patient's refrigerator and an unopened pack of paté of the same variety and the same date of manufacture contained *L. monocytogenes*. The average number of *L. monocytogenes* in the paté was 8,800 cfu/g. All isolates associated with

the case cluster belonged to serovar 1/2a and were non phage-typable. Three different profiles were obtained by restriction fragment length polymorphism (RFLP) analysis after cleavage with *EcoRI*. To simplify the RFLP analysis, hybridization with *E. coli* ribosomal RNA was investigated and similar patterns were found in clinical specimens from maternal/neonate pairs and the internal surface of the mincer at the paté "x" factory. As a result of the investigation, several strategies to prevent a recurrence were developed. Listeriosis was included on the list of notifiable diseases in Western Australia and information on the disease was made available to the health profession and the public.

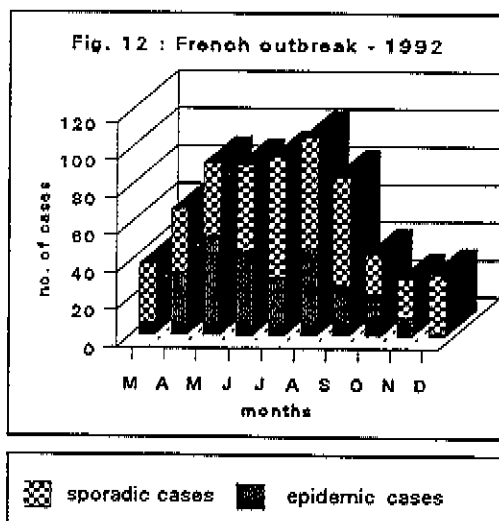
#### **Australia - smoked mussels** (adapted from Mitchell, 1991 and Misrachi et al., 1991)

In August 1991, a 37-year-old female experienced malaise, chills, fever and headaches starting several hours after the ingestion of about 90 g of smoked mussels. The symptoms progressed with vomiting and diarrhoea starting twelve hours later. The patient's 10-year-old son, who had ingested a similar quantity of the food, suffered similar symptoms but delayed by twelve hours from the index case. The patient's 13 year-old-daughter, who had consumed 130 g of the food, complained of some lethargy and malaise, but remained otherwise asymptomatic. Culture of the mussels grew *L. monocytogenes* at a count of  $1.6 \times 10^7$  cfu/g. The batches had been labelled with incorrect use-by dates after arrival in Tasmania. Some use-by labels overestimated the shelf-life by three months. The implicated mussels were withdrawn from sale, two public warnings were issued, and an information bulletin was circulated to all Tasmanian doctors. This was the first time in Tasmania that human illness has been associated with a confirmed source of *L. monocytogenes*.

#### **France - delicatessen**

Two hundred and seventy-nine cases (40 % of all reported cases in France) were caused by a strain serovar 4b and phagovar 2389/2425/3274/2671/47/108/340 between March and December 1992. This strain accounted for only 2-9 % of human infections in the previous five years. Among the 279 epidemic cases, 91 (33 %) were diagnosed in pregnant women or their newborn infants. Out of the 187 other cases (182 adults, 5 children), 61 % were immunodepressed. Eighty-five deaths were registered. There were epidemic cases in 79 of the 96 departments of metropolitan France and three of the overseas departments and territories. The monthly distribution of cases is shown in Fig. 12.

Epidemiological investigations carried out to identify the food vehicle(s) at the origin of this outbreak included (Veit, 1995) : i) Case-control study : two controls were matched with each case for health status (pregnancy, immunodepression), place of residence, sex and age. Patients and controls were interviewed using a detailed questionnaire about food habits during the month prior the case infection



; ii) Microbiological analysis of food samples from the shops where the patients regularly bought their food ; more than 3,000 strains were studied ; iii) Reinforcement of food safety controls (from producers to retailers) and corrective measures with regard to cheeses (110 ripening cellars and 1,942 producers), meat products (824 producers) and several other kinds of food (219 producers) ; iv) Analysis of foods in patients' refrigerators. More than 12,000 strains were screened for the epidemic clone by serogrouping and phage-typing and isolates belonging to the epidemic phagovar were further characterized by DNA macrorestriction pattern analysis (Jacquet et al., 1995).

The epidemic clone (as defined by phagovar and pulsovars) was identified in 206 foods, mostly delicatessen products in the retail distribution chain (various sausages, ham, paté, meat products in jelly). The first case-control study mainly dealt with basic food

habits and results suggested these products to be slightly more often consumed by patients. On the basis of microbiological results, a second case-control study (140 patients and 164 controls) was undertaken, with interviews focusing on various meat products freshly sliced by the butcher. The percentage of patients who consumed pork tongue in jelly brand "x" (46.5%), a ready-to-eat food, was significantly higher than those of controls (8.4%) (OR : 9.2 ; CI : 3.8 - 22.4) (Goulet *et al.*, 1993). Additional investigations demonstrated that among the 36 cases and 93 controls who did not eat pork tongue in jelly, 19% of epidemic cases, especially immunocompromised nonperinatal cases, were associated with the consumption of food items which were in contact with brand "x" pork tongue in jelly at the food store (OR : 3.3 ; CI : 1.2 - 8.9). This suggests that cross-contaminations in the retail store may play a substantial role in the transmission of foodborne listeriosis (Goulet *et al.*, 1993). Pork tongue in jelly was heavily contaminated ( $10^{4-6}$  cfu/g). Investigations of the plant and raw products could not identify the origin of contamination (Salvat *et al.*, 1995). Warnings about the consumption and preparation of foods at risk, especially delicatessen products, by persons at risk (i.e. pregnant women, immunocompromised people and the elderly) were regularly issued by the French media during the outbreak.

This was the second largest outbreak of listeriosis since 1981. The epidemic strain was of the same serovar and phagovar as the strains implicated in the epidemics in the USA (California) in 1985, Switzerland in 1983-1987 and Denmark in 1985-1987 but differed slightly by its DNA macrorestriction pattern with *Sma*I (Buchrieser *et al.*, 1993 ; Jacquet *et al.*, 1995).

#### *Norway (Lystad, 1992 and Lystad, 1992)*

A cluster of eight patients (one neonate and seven adults with predisposing conditions) was reported in the Trondheim area between April and August 1992 which constituted an unusual increase in the number of cases. Foods of one patient were analysed : five samples, from two meat products processed in the same plant, were positive for *L. monocytogenes*. Isolates from patients, from these foods and from the plant belonged to serogroup 1/2 and were indistinguishable by multilocus enzyme electrophoresis analysis. The incriminated products were withdrawn from the market and destroyed. This was the first foodborne listeriosis outbreak detected in Norway.

#### *New Zealand (adapted from Baker *et al.*, 1993 and Brett *et al.*, 1995)*

There was a possible cluster of perinatal cases in Auckland during November and December 1992. Three cases gave a history of consuming a particular brand of smoked mussels, and in one case *L. monocytogenes* was isolated from an unopened packet of these mussels from the case's refrigerator. Isolates were also obtained from unopened packets of this product obtained from a local supermarket. Isolates from two patients and from mussel specimens belonged to serogroup 1/2 and were indistinguishable by DNA macrorestriction pattern analysis. Following this observation, the Ministry of Health issued a statement advising the public to refrain from eating the implicated brand of smoked mussels. The public were advised to dispose of any current stocks because of potential contamination. In addition, the manufacturer took steps to recall contaminated products.

## **7.2. OTHER MODES OF TRANSMISSION**

Transmission by contaminated foods may be responsible for most sporadic cases, but other modes of transmission may also occasionally contribute.

### ***Transmission by cross-contamination during the neonatal period***

In hospitals, there are various modes of cross-infection. The typical pattern of cross-infection in neonatal cases appear to be environmental contamination from a community-acquired infection

brought into the delivery room by the mother of a severely infected infant. Most relevant reports describe the delivery of an infant with early onset listeriosis followed by the diagnosis of late onset infection in one or more infants born subsequently. Hospital cross-infections between newborn infants are observed with a low frequency. Two clusters, one in Finland and one in Italy, were reported in the questionnaires. Additional similar situation was published in 1991 (*Farber et al., 1991, Jean et al., 1991*). Shuchat *et al.* described a larger outbreak in Costa Rica in which one infant was infected at birth and eight others developed late onset disease. Several infants had pneumonitis and mineral oil from a single container used to bathe the infants, including the face, was contaminated with *L. monocytogenes* of the same serovar and isoenzyme profile as those isolated from the infants. The oil presumably became contaminated during the delivery of the source patient (*Schuchat et al. 1991*).

#### ***Transmission by direct contact with infected animals***

Listeriosis may be transmitted by direct contact with infected animals or animal material, although this is rare. This form of the disease usually occurs after an incubation period of 1-2 days as cutaneous lesions on the arms usually of farmers or veterinarians who have been in contact with congenital animal infection. An additional observation was published in 1992 (*Allock, 1992*).

#### ***Transmission by blood transfusion***

Strains of *L. monocytogenes* of the same serovar (1/2b), same phagovar and same pulsovars were isolated from blood culture of two patients in Bordeaux (France) in 1991. These two patients had received blood or red blood cells concentrates from the same donor. A strain with the same characteristics as those of the two patients was isolated from another sample from this donor. This observation strongly suggests transfusion-associated febrile reactions. Blood may be contaminated at the time of collection or processing and *L. monocytogenes*, a psychrotrophic microorganism, can then grow at cold temperatures during storage. However, this mode of transmission is certainly very rare. No *Listeria* was isolated from 50 units of blood returned to the blood bank following febrile transfusion reactions or from 50 bags not associated in transfusion reaction included as controls in a survey in the USA (*Walsh et al., 1993*)

## **8. RECOMMENDATIONS TO POPULATIONS AT RISK**

Prevention of listeriosis includes three types of actions : i) prevention and control of food contamination, ii) disease recognition (informing physicians to encourage early diagnosis of the disease, especially in pregnant women), and iii) dietary recommendations adapted to populations at risk.

Persons at increased risk for listeriosis (i.e., pregnant women, the elderly and those with immunosuppressive conditions) can decrease the risk of listeriosis by avoiding the consumption of foods known to be associated with listeriosis and by following basic food-handling hygiene practices that may also help prevent other foodborne diseases. Booklets have been issued with this aim. These are reproduced in the following pages.



Division of Bacterial and Mycotic Diseases

### Can listeriosis be treated?

When infection occurs during pregnancy, antibiotics given promptly to the pregnant woman can often prevent infection of the fetus or newborn. Babies with listeriosis receive the same antibiotics as adults, although a combination of antibiotics is often used until physicians are certain of the diagnosis. Even with prompt treatment, some infections result in death. This is particularly likely in the elderly and in persons with other serious medical problems.

### What is being done

Government agencies and the food industry have taken steps to reduce contamination of food by the *Listeria* bacterium. The Food and Drug Administration and the U. S. Department of Agriculture monitor food regularly. When a processed food is found to be contaminated, food monitoring and plant inspection are intensified, and if necessary, the implicated food is recalled.

The National Center for Infectious Diseases (NCID) is studying listeriosis in several states to help measure the impact of prevention activities and recognize trends in disease occurrence. NCID also assists local health departments in investigating outbreaks. Early detection and reporting of outbreaks of listeriosis to local and state health departments can help identify sources of infection and prevent more cases of the disease.

Further information on listeriosis is available from

Division of Bacterial and Mycotic Diseases  
National Center for Infectious Diseases  
Centers for Disease Control  
1600 Clifton Road, Mailstop C09  
Atlanta, Georgia 30333

### How can you reduce your risk for listeriosis?

#### General recommendations:

- Cook thoroughly raw food from animal sources, such as beef, pork, or poultry.
- Wash raw vegetables thoroughly before eating.
- Keep uncooked meats separate from vegetables and from cooked foods and ready-to-eat foods.
- Avoid raw (unpasteurized) milk or foods made from raw milk.
- Wash hands, knives, and cutting boards after handling uncooked foods.

Recommendations for persons at high risk, such as pregnant women and persons with weakened immune systems:

In addition to the recommendations listed above

- Avoid soft cheeses such as feta, Brie, Camembert, blue-veined, and Mexican-style cheese. (Hard cheeses, processed cheeses, cream cheese, cottage cheese, or yogurt need not be avoided.)
- Cook until steaming hot left-over foods or ready-to-eat foods, such as hot dogs, before eating.
- Although the risk of listeriosis associated with foods from deli counters is relatively low, pregnant women and immunosuppressed persons may choose to avoid these foods or thoroughly reheat cold cuts before eating.

## Preventing Foodborne Illness: Listeriosis

Listeriosis, a serious infection caused by eating food contaminated with the bacterium *Listeria monocytogenes*, has recently become an important public health problem in the United States. The disease affects primarily pregnant women, newborns, and adults with weakened immune systems. It can be avoided by following a few simple recommendations.



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
CENTERS FOR DISEASE CONTROL AND PREVENTION  
1600 CLIFTON ROAD, ATLANTA, GEORGIA 30333

May 1992

### How great is the risk for listeriosis?

In the United States, an estimated 1,850 persons become seriously ill with listeriosis each year. Of these, 425 die.

At increased risk are

- **Pregnant women**  
They are about 20 times more likely than other healthy adults to get listeriosis. About one-third of listeriosis cases happen during pregnancy.
- **Newborns**  
Newborns rather than the pregnant women themselves suffer the serious effects of infection in pregnancy.
- **Persons with weakened immune systems**
  - Persons with cancer, diabetes, or kidney disease
  - Persons with AIDS.
- **They are almost 300 times more likely to get listeriosis than people with normal immune systems.**
  - Persons who take glucocorticosteroid medications
  - The elderly

Healthy adults and children occasionally get infected with *Listeria*, but they rarely become seriously ill.

### How does *Listeria* get into food?

*Listeria monocytogenes* is found in soil and water. Vegetables can become contaminated from the soil or from manure used as fertilizer. Animals can carry the bacterium without appearing ill and can contaminate foods of animal origin such as meats and dairy products. The bacterium has been found in a variety of raw foods, such as uncooked meats and vegetables, as well as in processed foods that become contaminated after processing, such as soft cheeses and cold cuts at the deli counter. Unpasteurized (raw) milk or foods made from unpasteurized milk may contain the bacterium.

### Persons of risk can prevent *Listeria* infection by avoiding certain high-risk foods and by handling food properly.

*Listeria* is killed by pasteurization, and heating procedures used to prepare ready-to-eat processed meats should be sufficient to kill the bacterium; however, unless good manufacturing practices are followed, contamination can occur after processing.

### How do you get listeriosis?

You get listeriosis by eating food contaminated with *Listeria*. Babies can be born with listeriosis if their mothers eat contaminated food during pregnancy.

Although healthy persons may consume contaminated foods without becoming ill, those at increased risk for infection can probably get listeriosis after eating food contaminated with even a few bacteria. Persons at risk can prevent *Listeria* infection by avoiding certain high-risk foods and by handling food properly.

### How do you know if you have listeriosis?

A person with listeriosis usually has fever, muscle aches, and sometimes gastrointestinal symptoms such as nausea or diarrhea. If infection spreads to the nervous system, symptoms such as headache, stiff neck, confusion, loss of balance, or convulsions can occur.

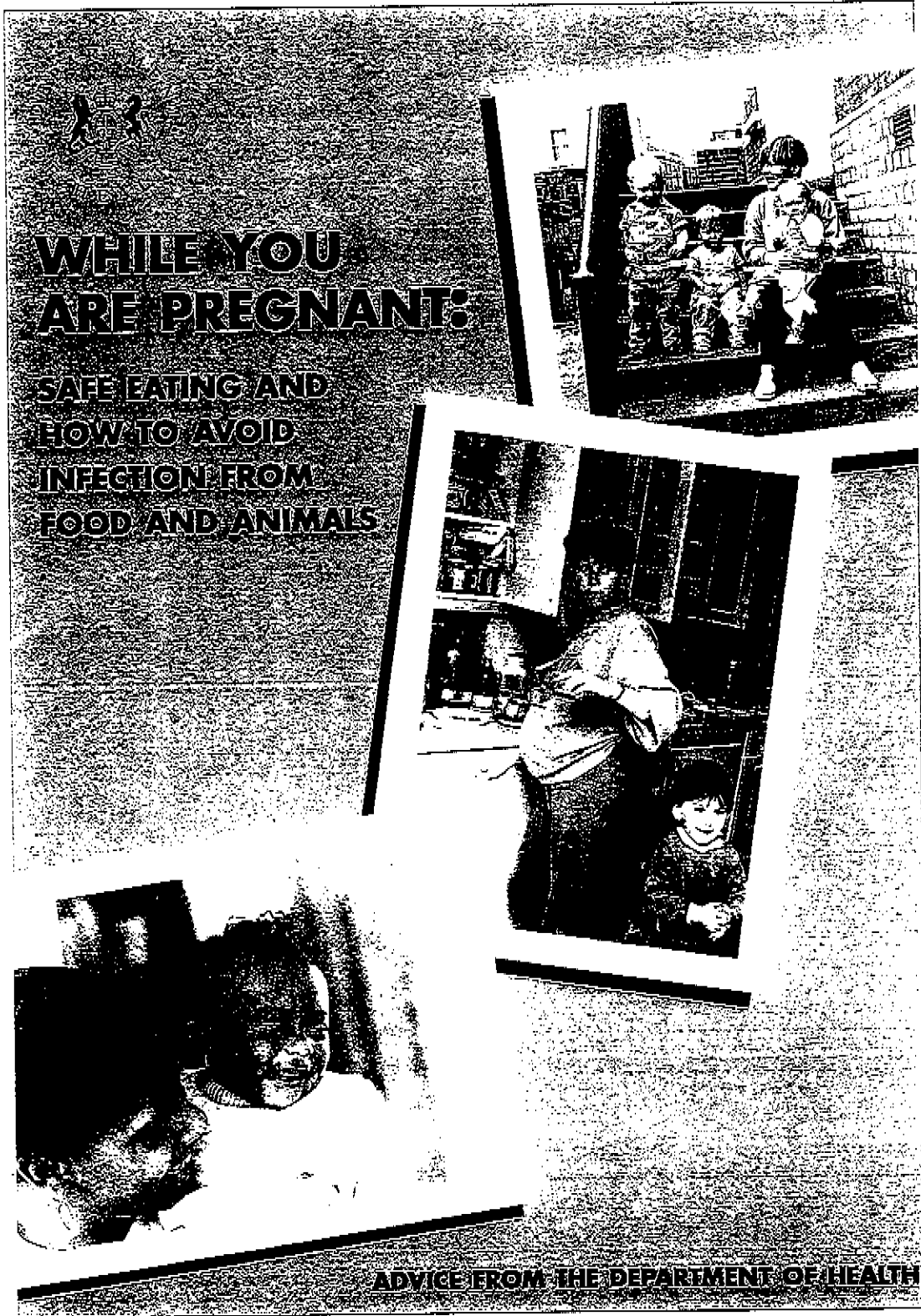
Infected pregnant women may experience only a mild, flu-like illness; however, infection during pregnancy can lead to premature delivery, infection of the newborn, or even stillbirth.

There is no routine screening test for susceptibility to listeriosis during pregnancy, as there is for rubella and some other congenital infections. If you have symptoms such as fever or stiff neck, consult your doctor. A blood or spinal fluid test (to cultivate the bacteria) will show if you have listeriosis. During pregnancy, a blood test is the most reliable way to find out if your symptoms are due to listeriosis.

### Can listeriosis be prevented?

The general guidelines recommended for the prevention of listeriosis are similar to those used to help prevent other foodborne illnesses, such as salmonellosis.

Recommendations to pregnant women - UK



**WHILE YOU ARE PREGNANT:**  
**SAFE EATING AND HOW TO AVOID INFECTION FROM FOOD AND ANIMALS**

**ADVICE FROM THE DEPARTMENT OF HEALTH**

## Salmonellosis

### What is it?

In its mild form, this illness resembles influenza (flu). It is important to take special precautions to avoid listeriosis while you are pregnant because even the mild form of the illness in the mother can result in miscarriage, still birth, or severe illness in the new-born baby.

Listeriosis is caused by bacteria (germs or bugs) called *Listeria monocytogenes* (listeria). High levels of these bacteria have been found in some foods and it therefore makes sense to avoid them when you know you are pregnant. There is no need to avoid these foods before you know you are pregnant or after the baby is born, including when you are breast feeding.

However, it is a very rare disease. The reported incidence in 1990 was approximately 1 in 30,000 live and still births.

## Salmonellosis

### What is it?

Certain ripened soft cheeses such as the camembert, brie, and the blue-veined varieties may contain high levels of listeria. Do not eat these sorts of cheese if you are pregnant.

However, you can still enjoy hard cheeses, as well as cottage cheese, processed cheese and cheese spreads. There is no need for you to avoid these types of cheese.



## Pate

There may be high levels of listeria in some types of pate. To be on the safe side, do not eat any type of pate while you are pregnant.

## Salmonellosis

Cook-chill foods are ready-cooked meals kept cold (not frozen) for the customer either to eat cold or reheat at home. Listeria has been found in very small amounts in cook-chill meals and ready-to-eat poultry. To be on the safe side, while you are pregnant, you are advised to reheat these types of food thoroughly until they are piping hot rather than to eat them cold.

## Sheep

Sheep may miscarry or give birth to sick lambs following infection with listeria. Pregnant women should not help with lambing, or milk ewes that have recently given birth, or touch the afterbirth, or come into contact with new-born lambs.

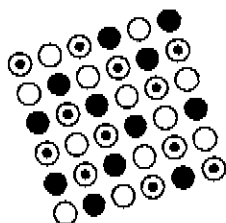
## Salmonellosis

Salmonellosis is caused by bacteria called *Salmonella* and is one of the commonest causes of food poisoning, giving rise to sickness and diarrhoea. Although it may not have any direct effect on your unborn child, it is sensible to do your best to avoid this distressing illness while you are pregnant.

## What foods are "safe" for pregnant women?

- all freshly cooked foods,
- pasteurised dairy foods (cheese, fresh pasteurised milk, UHT milk, yoghurt and the like)
- freshly washed vegetables and fruit
- all tinned foods
- bread and baked foods without cream or custard
- dried food
- cereals
- beverages

The health protection section of your area health board can provide you with further information on food.

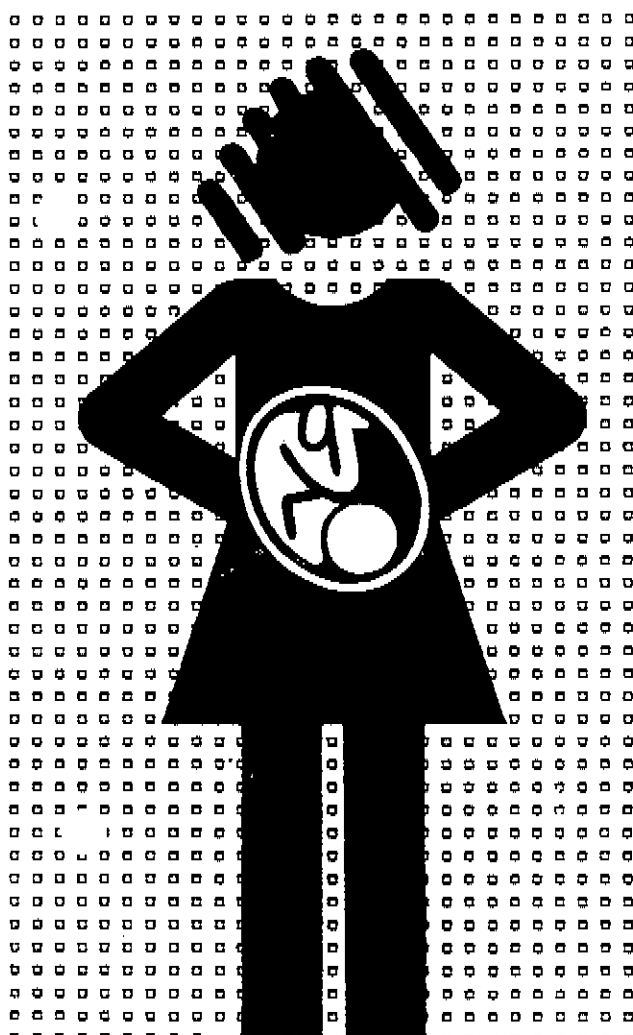


Department  
of Health  
TE TARI ORA

Department of Health, Te Tari Ora, New Zealand. Code 4156

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# LISTERIA INFECTION and pregnancy



## What is Listeria infection?

Listeria is a common bacterium (germ) which is found everywhere. It is in the soil, water and plants, and in the droppings and faeces of animals and humans. It has almost no effect on healthy adults and children, even though most people are exposed to it regularly.

In some cases, the listeria bacterium can cause a rare food-related illness. When this occurs the infection is called listeriosis.

Listeriosis is dangerous for pregnant women, as it can cause miscarriage and stillbirth. Listeriosis has a high death rate for newborns.

The time taken for Listeria to show symptoms is thought to range between a few days and several weeks.

## The risk

For most healthy people there is very little risk.

The risk increases when processed foods without preservative are:

- not handled safely
- not properly heated
- stored for long periods.

The risk is greatest when a woman is pregnant and eats contaminated food.

## Will foods keep safe from Listeria in the fridge?

No. Listeria is one of the few food-spoiling bacteria that will multiply on food still in the fridge. The longer food is stored in the fridge the greater the risk.

It is still wise to store any perishable food in the fridge.

## What are the symptoms of Listeria infection?

After being infected with Listeria a person may show no symptoms or may become ill with a mild influenza-like illness with:

- a mild fever
- headache
- aches and pains

Stomach upsets may also occur.

Some pregnant women may suffer a severe illness with a high temperature. If this happens there is a danger that the unborn baby will be infected.

If you think you might have Listeria infection, see your doctor.

## How can Listeria infection be avoided?

For healthy adults and children, safe food preparation and thorough cooking will be enough to reduce the risk of Listeria.

Pregnant women are at special risk. The risk can be reduced by:

- safe food handling
- cooking food until "piping hot", especially when using microwave ovens
- eating freshly cooked food
- ensuring that raw fruit and vegetables are properly washed
- if eating cooked food which has been stored in the fridge, re-heating it so that it is "piping hot"
- not eating any food from the following list
  - chilled pre-cooked seafood products, unless eaten hot
  - pate, pre-cooked chicken, ham and other chilled pre-cooked meat products
  - uncooked seafoods
  - stored salads and coleslaws
  - raw (unpasteurised) milk, is another risk for pregnant women.

Foods which were first cooked or prepared more than 12 hours ago may not be safe, unless thoroughly re-heated.

## Évitez un accouchement prématuré

En France, 45 000 enfants par an naissent prématurés, c'est-à-dire avant la fin du 8<sup>ème</sup> mois de grossesse (37 semaines après les dernières règles). Une grossesse dure 9 mois et un bébé a besoin de tout ce temps pour se développer harmonieusement.

### Les risques

- les précautions prises au moment de la naissance sont plus élevées et la maturité nécessaire (poumons, cerveau, foie...)
- ces bébés, fragiles et de petit poids de naissance, présentent des difficultés d'alimentation au moment de l'allaitement.
- les naissances prématurées sont source de pathologies et de handicaps.
- les hospitalisations perturbent les premières relations si importantes entre les parents et leur enfant.

### Les contractions, sachez les reconnaître :

- le ventre est dur puis se relâche,
- les contractions sont irrégulières si elles sont fréquentes (1 de 10 par jour),
- les contractions sont anormales si elles sont douloureuses.

#### Repondez vous :

- Si elles persistent, consultez sans tarder

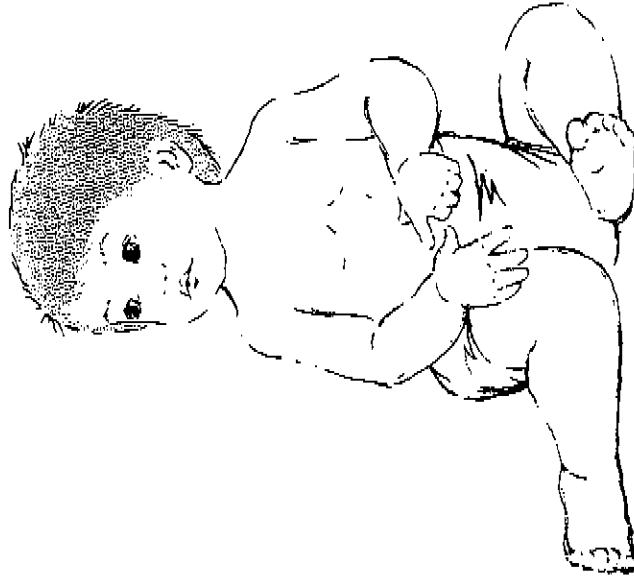
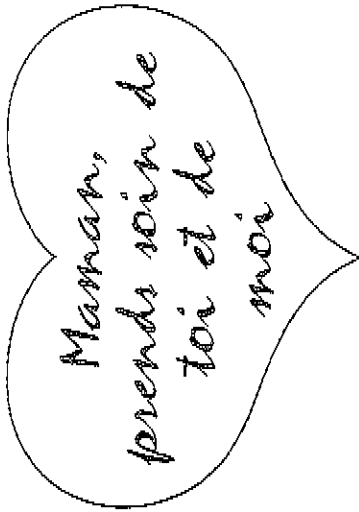
### La prévention

- La femme enceinte a besoin d'un soutien d'exercice (marche, natation).
- Prenez du repos et évitez les sports violents (équitation, ski, moto...).
- Si vous devez déménager, faites-le au tout début de la grossesse ou après la naissance.

#### Prenez du temps pour vous, réservez-vous des moments de repos.

- Dès le 7<sup>ème</sup> mois de la grossesse :
  - Évitez les longs trajets et préférez le train à la voiture.
  - Faites-vous aider pour les travaux ménagers pénibles (lavage des vitres, du sol...).
  - Ne portez pas de lourdes charges (meubles, provisions...).

Protéger votre enfant,  
c'est aussi faire suivre votre grossesse...



Conception : DIRECTION GÉNÉRALE DE LA SANTÉ  
Service de l'Information et de la Communication



## Évitez 2 ennemis de votre grossesse et de votre bébé

### Alcool

Le fœtus que vous respirez et l'alcool que vous buvez sont nocifs pour votre bébé parce qu'ils peuvent provoquer :

- un retard de croissance in utero : les bébés de mères fumeuses présentent en moyenne 200 grammes de moins,
  - des malformations et des retards de développement physique et psychologique.
- Un plus grand risque d'intoxication (OI) et respiratoires chez les bébés exposés à la fumée.

### Par des habitudes simples

- arrêtez de fumer ou modérez au maximum votre consommation,
  - évitez les ambiances enfumées.
- évitez de consommer des boissons alcoolisées pendant toute la durée de votre grossesse et surtout pendant les premières semaines.

### Qui pourraient devenir définitives

Méfions : si j'ai autant d'alcool dans un verre de vin, un demi de bière ou un petit verre d'apéritif.



## Pendant la grossesse

**ÊTES-VOUS PROTÉGÉE CONTRE LA RUBÉOLE, UN TORCHUSISME ET**  
 ○ le premier examen prénatal vous opposera la réponse,  
 ○ si vous n'avez pas contracté la toxoplasmose, vous serez surveillée jusqu'à la fin de votre grossesse. Votre médecin et votre sage-femme vous donneront des conseils adaptés.  
 ○ si vous n'avez pas contracté la rubéole, une vaccination vous sera proposée après votre accouchement.

**DÉPLAIS ÉMOTIONNELS, LE DÉPISTAGE DE L'ÉPÉPTE À EST OMBRÉTIQUE.**  
 ○ si vous êtes atteinte de cette maladie, votre bébé pourra être pris en charge et soigné après sa naissance.

## Après la naissance

**VOUS DEVEZ LE FAIRE VACCINER CONTRE :**

- la diphtérie,
- la tétanos,
- la poliomyélite,
- la coqueluche,
- la tuberculose (B.C.G.).

**MIS PRÉVENIR RUSSI À LE FAIRE VACCINER CONTRE :**

- la rougeole, les oreillons, la rubéole,
- l'hémophilus influenzae B (cette dernière de valingite).

Faites examiner et bébé si vous voyagez en pays tropicaux, renseignez-vous auprès de votre médecin.  
 Plus que toute autre personne, il faut éviter d'attraper certaines maladies et prendre des précautions particulières.



## Pendant la grossesse, prenez des précautions simples pour éviter 2 infections graves

### TORCHUSISME

**CE SONT DES MALADIES QUI PEUVENT ÊTRE GRAVES POUR VOTRE BÉBÉ ET QUI PEUVENT PROVOQUER :**

- des malformations sévères
- un avortement ou une malinjection

### Par des gestes simples

**FAITES ATTENTION À VOS DÉPLAIS ET À VOS HABITUDES ALIMENTAIRES.**

- évitez les fromages (surtout ceux avec du lait cru).
- faites votre soigneusement les aliments crus d'origine animale (viandes, volailles, saumon...).
- préférez les produits de dinatoire préemballés et consommez rapidement ces produits après leur achat.

**FAITES ATTENTION À VOTRE RÉFRIGÉRIATEUR.**

- rangez correctement les aliments en séparant les produits crus et les produits crus.
- protégez vos aliments (charcuterie, fromages, plats préparés) en les emballant ou en les plaçant dans des récipients fermés et propres.
- vérifiez à ce que la température de votre réfrigérateur soit bien froide.
- nettoyez deux fois par mois votre réfrigérateur : une désinfection à l'eau de javal, suivie d'un rinçage minutieux et déodorant.

**RESPECTEZ DES NÈVES D'HYGIÈNE SÉVÈRES**

- lavez vos mains soigneusement à l'eau et savons après avoir mangé.
- nettoyez les surfaces de contact après un contact avec des aliments crus.
- ne laissez pas des bœufs pelliculés à température ambiante.
- lavez soigneusement les mains avant le repas.

et

Si le déptage positif par votre médecin indique que vous n'êtes pas protégée contre le TORCHUSISME :  
 ○ évitez le contact avec les chats et leurs excréments ou portez des gants et lavez-vous les mains après toutes manipulations chat que pendant le nettoyage.

## 9. CONCLUDING REMARKS

Listeriosis was mainly observed in industrialized countries in 1991 and 1992 according to the information received. Most cases of human listeriosis appeared to be sporadic, although a portion of these sporadic cases could be unrecognized common-source outbreaks. The source and route of infection are for most cases unknown for various reasons including the long incubation period and the ubiquitous distribution of the microorganism in environment. However, data gathered during this period have greatly enhanced our understanding of foodborne transmission by the description of new outbreaks. Data from case-control studies of sporadic cases has provided additional evidence for the foodborne transmission of listeriosis. The case control study in the USA suggests that foodborne transmission could account for at least one third of sporadic cases. Data accumulated during this period and before indicate that high risk food are ready-to-eat foods which have been stored at +4°C. These high-risk foods are most often contaminated with a strain of serovar 4b. However, in spite of various and extensive epidemiological investigations, the value of the infectious dose of *L. monocytogenes* is not yet known.

The annual number of cases has decreased in some countries. This decline may be attributed to the measures implemented by the food industry and/or to the success of education efforts, especially those targeting pregnant women. However, despite the lower incidence recorded in recent years, there have been outbreaks of listeriosis during this period. These outbreaks emphasize the need for vigilance by all those involved in the prevention and the surveillance of the disease.

Surveillance systems need to be further developed since an increase in incidence in a community may go undetected and it is through the detection of such clusters that common-source outbreaks can be detected, investigated and prevented. Careful epidemiological investigations of sporadic and epidemic cases to identify risk factors for disease and research to determine organism-specific virulence factors remain a priority.

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**11. WHO MULTICENTRE STUDY ON *Listeria monocytogenes* TYPING**

(adapted from *Bille et al, in press*)

**1991**

The Food Safety Unit of the World Health Organization (Geneva) mandated its two collaborative centres for foodborne listeriosis (J. Bille, Lausanne, Switzerland and J. Rocourt, Paris, France) to organize a multicentre study of *L. monocytogenes* typing methods. The goals were i) to select the most appropriate methods for investigating listeriosis epidemiology ; ii) to standardize the selected methods and iii) to develop a common nomenclature for varieties.

The first step consisted in assessing existing methods and to establish a list of laboratories involved in *Listeria* typing. A questionnaire was sent to all scientists known to work in this field in October 1991 (46 laboratories in 20 countries). Thirty-five were returned (see *Rocourt & Brosch, 1992* for list of methods and laboratories) and evidenced the variety of typing methods used. Furthermore, for any particular method, an even larger variety of procedures is used. Thus, the complete lack of standardization of methods, interpretation of results and nomenclature of varieties precluded meaningful comparisons of results obtained in different laboratories.

**1992**

The second step was organized during the XIth ISOPOL (International Symposium on the Problems of Listeriosis) meeting in Copenhagen, in May 1992. The following organization was adopted :

i) Two organizers (J.B. and J.R.), assisted by two co-organizers (B. Swaminathan and J. McLauchlin)

were to select a set of coded strains to be typed, choose for each subtyping method one or two coordinators, collect and analyse the results and make propositions in relation to the objectives.

ii) The coordinators were asked to make minimal recommendations concerning the typing method they coordinated, collect data from individual participants and analyse them. It was decided to standardize the procedures as little as possible, in order to preserve the potentiality of all procedures.

A set of 80 strains was selected to allow the most accurate assessment of the characteristics of the different typing methods :

i) Intralaboratory reproducibility was tested using 11 duplicated strains and 22 groups of 2 to 8 epidemiologically related strains to test the within-group reproducibility.

ii) Discriminatory power was investigated with these 22 groups, and a further 9 strains which were not epidemiologically related. The discriminatory power would thus be tested in two ways : first, the ability of a typing method to recognize the homogeneity of strains within a given group of epidemiologically related strains ; and secondly, its capacity to discriminate between groups and/or between unrelated strains.

iii) Inter-laboratory reproducibility was not a major priority of this phase of the study, particularly because no prior standardization was attempted.

Twenty-six laboratories from 15 countries agreed to participate in this study with one to four methods, representing a total of 38 sets of strains analysed. Strains were kindly prepared and distributed to all participants by J. McLauchlin.

The time schedule allowed 9 months to complete the typing work after reception of the set of 80 coded strains (December 1993). Individual results were sent to coordinators on January 1994. The strains code was divulgated on April 1994, after which coordinators analyzed the data. A report on this phase is currently in press (Int. J. Food Microbiol.).

#### List of participants

serotyping : A. Schönberg<sup>1</sup> (Germany), E. Bannerman (Switzerland), A.L. Courtieu (France), R. Kiss (Hungary), J. McLauchlin and S. Shah (UK) and D. Wilhelms (Germany)

phage-typing : J. McLauchlin<sup>1</sup> (UK), A. Audurier (France), A. Frommelt and P. Gerner-Smidt (Denmark), Ch. Jacquet (France), M.J. Loessner (Germany), S. Shah (UK) and D. Wilhelms (Germany)

multilocus enzyme electrophoresis : D. Caugant<sup>1</sup> (Norway), F.E. Ashton (Canada), W.F. Bibb (USA), P. Boerlin (Switzerland), W. Donachie (UK), A. Gilmour (UK), B. Norrung (Denmark)

ribotyping : B. Swaminathan<sup>1</sup>, S. Hunter and L.M. Graves (USA), P.M. Desmarchelier (Australia), P. Gerner-Smidt (Denmark), S. Harlander (USA), Ch. Jacquet (France), A. Ridley (UK), J.A. Webster (USA)

high-frequency endonuclease typing : P. Gerner-Smidt<sup>1</sup> and J. Schmidt (Denmark), P. Boerlin and F. Ischer (Switzerland)

low-frequency endonuclease typing : R. Brosch<sup>1</sup> and J.B. Luchansky (USA), M. Brett (New Zealand), B. Catimel (France), B. Ojeniyi (Denmark)

RAPD (Rapid Amplification of polymorphic DNA) : K. Wernars<sup>1</sup> (The Netherlands), P. Boerlin (Switzerland), A. Audurier and N. Van der Mee-Marquet (France), E.G. Russell (Australia), G.D.W. Curtis (UK) and L. Herman (Belgium)

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<sup>1</sup> : coordinator

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### 13. ANNEX 1 : ADDITIONAL INFORMATION PUBLISHED IN 1991 AND 1992

ALADRO BENYO, Y.; PEREZ CORREA, S. E.; ELCUAZ ROMANO, R.; ANGEL-MORENO MARATO, A., AND GRANADO MONZON, R. Listeriosis in the nonpregnant adult during an epidemic outbreak on Grand Canary. *Rev. Clin. Esp.* 1995; 195:154-159.

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