Research Articles

Travel associated legionellosis among European tourists in Spain

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Introduction

Travel associated Legionnaires' disease has caused concern among European countries since the second half of the 1980s because of the morbidity among citizens of the European Union and because of the threat posed to the economies of the Mediterranean countries by the occurrence of the disease among tourists. As a result, the European Working Group for Legionella Infections (EWGLI) (1) was set up in 1986 coordinated by the National Bacteriology Laboratory in Stockholm until 1993 when this role was transferred to the Public Health Laboratory Service Communicable Disease Surveillance Centre in London. Case reports are sent from patients' countries of residence to countries they have visited.

EWGLI has developed a surveillance scheme based on a computer software program, the European Legionellosis Surveillance Scheme (ELSS). Monthly updates are sent to all collaborators of all available data from throughout Europe since 1987 (2). The aim of this study was to analyse data covering cases of legionellosis associated with travel to Spain, including the Balearic and Canary islands.

Method

An Epi Info analysis was run on the ELSS program database, updated as of 31 December 1995. The numbers of travellers who had arrived from other European countries and stayed in tourist accommodation in Spain were obtained from the Spanish National Statistics Office (INE) (3,4) and used as denominators to calculate rates.

The ELSS program contains two interrelated databases: each record on one database consists of a single accommodation address for a given patient during the incubation period, so that for any one case there are as many records as there are accommodation addresses during a specific trip; the second database contains information about individual patients, with one record per case. These two databases can be linked and cross-referenced using a case-ID field. For the purposes of analysis, Dbase III Plus and Epi Info 6.01 software packages were used. Since all cases reported in Europe are pooled in the same databases, the first task was to separate patients who had travelled to Spain from those who had been to other European destinations. The second step was to code regions (using the designated Spanish Autonomous Region codes) and accommodation addresses.

Hotels and holiday apartments in Spain have a similar structure and management and so we studied both together.

The duration of stay in Spain was calculated for all patients, as were the periods between arrival in Spain and the onset of symptoms and between return to country of permanent residence and the onset of symptoms. These periods were calculated for all hotel stays in the case of travellers who had stayed in more than one hotel.

The incubation period for legionellosis was taken as two to 10 days (5). The disease was said to be confirmed if any legionella was cultured or if a fourfold rise in the titre of antibodies against *Legionella pneumophila* sg1 titre was observed. A presumptive diagnosis of *L. pneumophila* sg1 infection was made if the case was diagnosed on the basis of a single high antibody titre or if another method was used, that is the word "other" appeared in the report of the case. Infections with all other *Legionella* species or serotypes were regarded as presumptive unless diagnosed by culture.

The criterion chosen in this study to define case-clustering in any one hotel was the appearance of more than one case in the same calendar year or the appearance of a single case in two or more successive years.

Results

A total of 281 cases were reported from 1987 to 1995. In 1995 two duplicate cases (repetition of case ID codes) were eliminated. Men accounted for 69% of cases overall, 54% of whom were aged 45 to 64 years. Women accounted for 29% of cases, 46% of whom were aged 45 to 64 years, the most numerous group (table 1). The sex of 2% of cases was unknown.

Tableau 1 : Légionelloses chez des touristes européens en Espagne, 1987-1995. Répartition par âge et par sexe
Table 1: Legionellosis among European tourists in Spain, 1987-1995. Distribution by age and sex.

		Sexe / Sex		
Groupe d'âge	Masculin	Féminin	Inconnu	Nombre total (%)
Age group	Male	Female	Unknown	Total number (%)
0 - 24	0	3	0	3 (1)
25 - 44	29	16	0	45 (16)
45 - 64	104	37	1	142 (51)
> 64	58	24	0	82 (29)
Inconnu				
Unknown	3	1	5	9 (3)
TOTAL	194 (69)	81 (29)	6 (2)	281 (100)

The largest number of cases (53) was reported in 1990 (figure 1). The average of 40 cases were reported each year from 1989 to 1995. Only six cases had been registered before 1989.

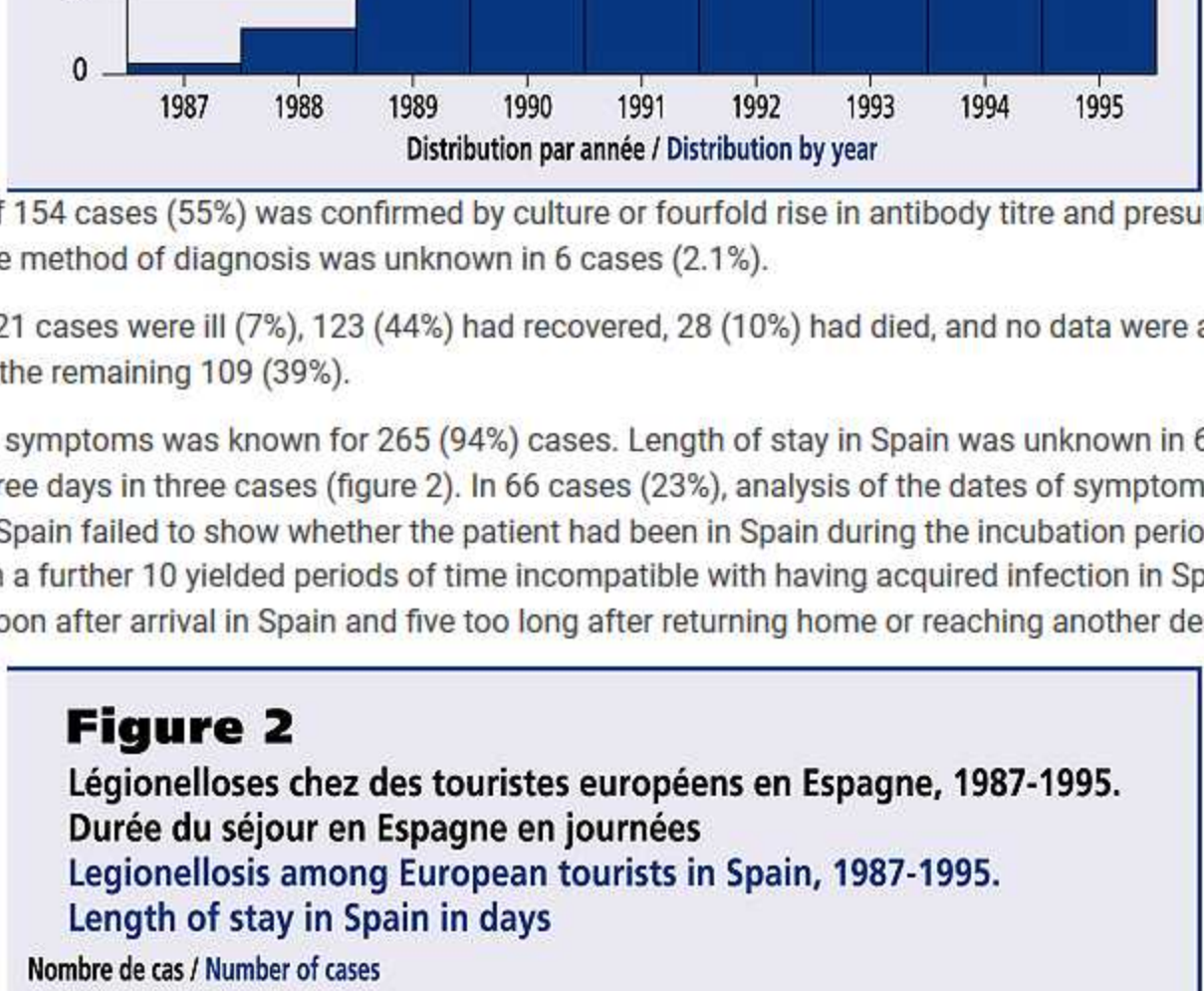

Figure 1
Légionelloses chez des touristes européens en Espagne, 1987-1995
Legionellosis among European tourists in Spain, 1987-1995

The diagnosis of 154 cases (55%) was confirmed by culture or fourfold rise in antibody titre and presumed in 121 cases (43%). The method of diagnosis was unknown in 6 cases (2.1%).

When reported, 21 cases were ill (7%), 123 (44%) had recovered, 28 (10%) had died, and no data were available on the health status of the remaining 109 (39%).

Date of onset of symptoms was known for 265 (94%) cases. Length of stay in Spain was unknown in 60 cases (21%) and less than three days in three cases (figure 2). In 66 cases (23%), analysis of the dates of symptom onset and dates of stay in Spain failed to show whether the patient had been in Spain during the incubation period of the disease. Data on a further 10 yielded periods of time incompatible with having acquired infection in Spain: five having become ill too soon after arrival in Spain and five too long after returning home or reaching another destination.

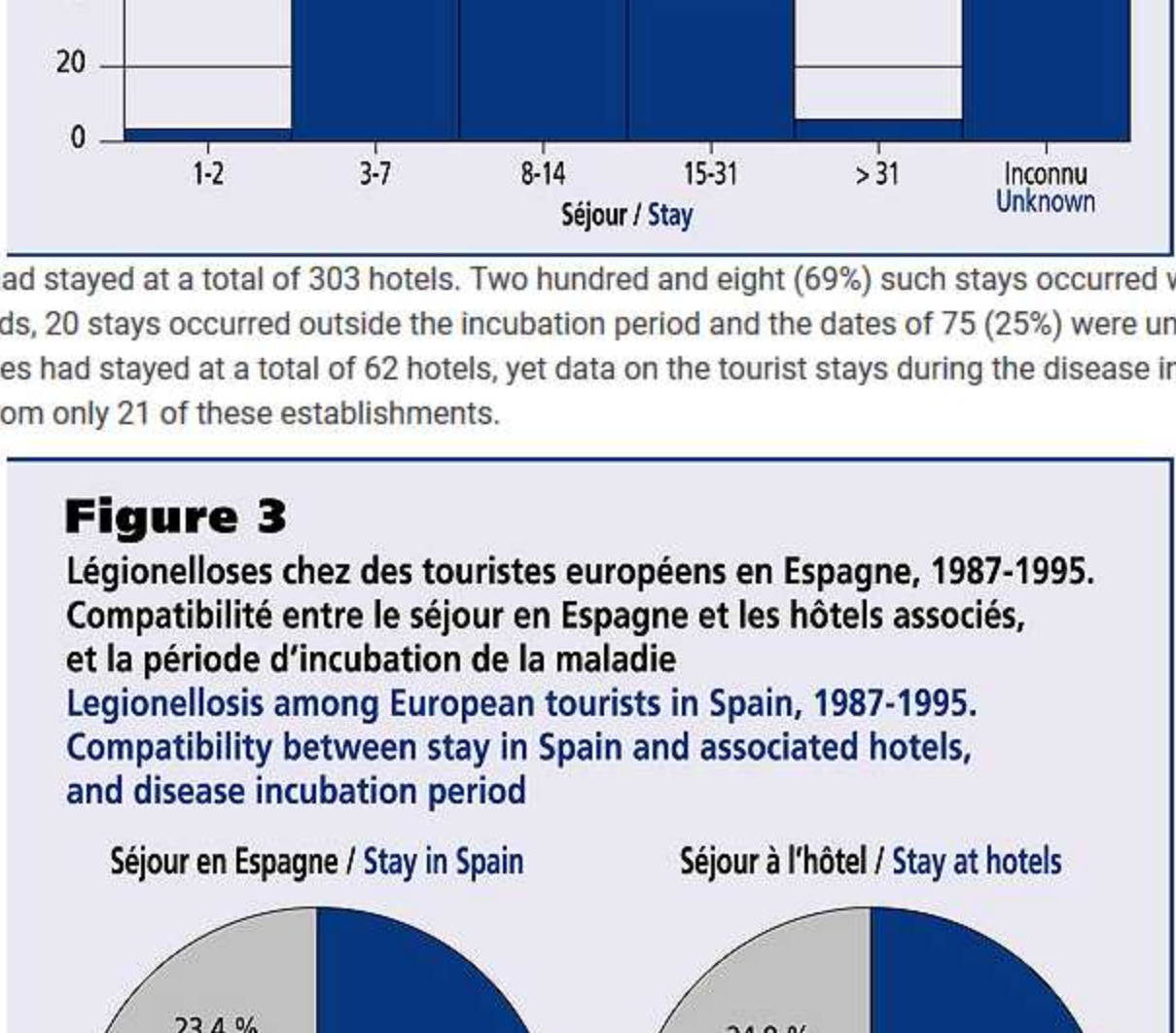

Figure 2
Légionelloses chez des touristes européens en Espagne, 1987-1995.
Durée du séjour en Espagne en journées
Legionellosis among European tourists in Spain, 1987-1995.
Length of stay in Spain in days

The 281 cases had stayed at a total of 303 hotels. Two hundred and eight (69%) such stays occurred within the likely incubation periods, 20 stays occurred outside the incubation period and the dates of 75 (25%) were unknown (figure 3). Nineteen cases had stayed at a total of 62 hotels, yet data on the tourist stays during the disease incubation period were available from only 21 of these establishments.

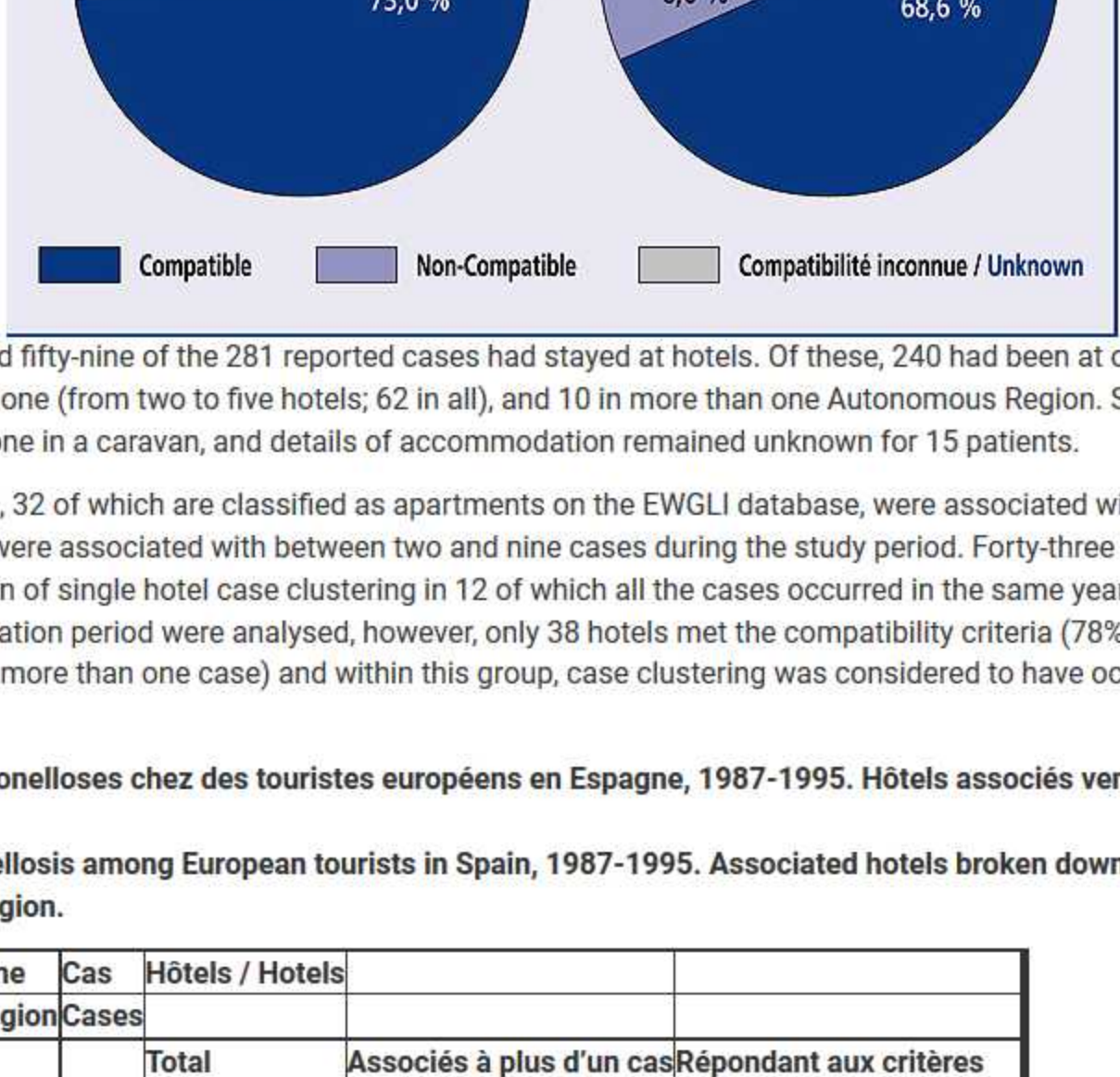

Figure 3
Légionelloses chez des touristes européens en Espagne, 1987-1995.
Compatibilité entre le séjour en Espagne et les hôtels associés, et la période d'incubation de la maladie
Legionellosis among European tourists in Spain, 1987-1995.
Compatibility between stay in Spain and associated hotels, and disease incubation period

Two hundred and fifty-nine of the 281 reported cases had stayed at hotels. Of these, 240 had been at only one hotel, 19 at more than one (from two to five hotels; 62 in all), and 10 in more than one Autonomous Region. Six stayed in private homes, one in a caravan, and details of accommodation remained unknown for 15 patients.

In all, 186 hotels, 32 of which are classified as apartments on the EWGLI database, were associated with cases and 49 of these hotels were associated with between two and nine cases during the study period. Forty-three of the 49 hotels met the definition of single hotel case clustering in 12 of which all the cases occurred in the same year. When stays during the incubation period were analysed, however, only 38 hotels met the compatibility criteria (78% of all those associated with more than one case) and within this group, case clustering was considered to have occurred in 34 (table 2).

Tableau 2 : Légionelloses chez des touristes européens en Espagne, 1987-1995. Hôtels associés ventilés par Région autonome.
Table 2: Legionellosis among European tourists in Spain, 1987-1995. Associated hotels broken down by Autonomous Region.

Région Autonome	Cas	Hôtels / Hotels		
Autonomous Region	Cases			
		Total	Associés à plus d'un cas	Répondant aux critères
		Total	Associated with more	d'agrégats de cas (1)
			than one case	Clustering criteria met (1)
Iles Baléares				
Balearic Isles	103	60	19	17
Catalogne				
Catalonia	55	33	9	9
Région de Valence				
Valencian Region	39	26	9	6
Iles Canaries				
Canary Islands	33	27	4	3
Andalusia				
Andalousie	34	32	6	6
Reste de l'Espagne				
Rest of Spain	4	9	2	2
Autre (2)				
Other (2)	10	-	-	-
Inconnue				
Unknown	3	-	-	-
TOTAL	281	186	49	43

(1) Plus d'un cas dans une année ou un seul cas dans au moins deux années consécutives /
More than one case in any one year or a single case in two or more successive years.
(2) Plus d'une région visitée, sans détermination de celle à l'origine de la contamination /
Visited more than one region, without it being possible to ascertain in which infection took place.

From 1989 to 1995, the highest mean annual incidence occurred in the Valencian Region (0.85 cases per 100 000 European tourists) and the lowest in Andalusia (0.31 per 100 000). Rates varied considerably from year to year owing to the small number of cases. The only region with a stable incidence was the Balearic Isles (0.50/100 000; 95% confidence interval (CI) 0.03-1.12), from which 101 cases were reported, a little over a third of the overall total (table 3).

Tableau 3 : Légionelloses chez des touristes européens en Espagne. Cas et taux moyens annuels par Région Autonome, 1989-1995.
Table 3: Legionellosis among European tourists in Spain. Cases and annual mean rates by Autonomous Region, 1989-1995.

		Taux moyen annuel / Annual mean rate	
	Cas / Cases	(cas pour 100 000 touristes européens /	
		cases per 100 000 European tourists)	
Région Autonome /		Taux / Rates	I.C. 95% / 95% C.I.
Autonomous Region			
Région de Valence			
Valencian Region	37	0.85	(0-2.86)
Iles Baléares			
Balearic Isles	101	0.50	(0.03-1.12)
Catalogne			
Catalonia	55	0.35	(0-1.00)
Iles Canaries			
Canary Islands	32	0.32	(0-1.16)
Andalusia			
Andalousie	33	0.31	(0-1.11)
Reste de l'Espagne			
Rest of Spain	4	0.03	(0-0.51)
Autre (1)			
Other (1)	10		
Inconnue			
Unknown	3		
TOTAL			
TOTAL	275	0.38	(0.16-0.65)

(1) Plus d'une région visitée / Visited more than one region

Distribution of cases by country of residence showed that Swedish tourists had the highest rate of illness (mean annual rate of 2.52 cases/100 000 European tourists) and Germans had the lowest (0.06/100 000). As with regional case distribution, rates by country of origin proved unstable from year to year, and statistical significance was observed only for British cases, with 184 diagnosed cases from 1989 to 1995 (70% of the total) and a rate of 1.12/100 000 (95% CI 0.33-2.10) (table 4). Both rates were calculated for years 1989-95, given that until 1989, only 6 cases had been reported.

Tableau 4 : Légionelloses chez des touristes européens en Espagne. Cas et taux moyen annuel par pays d'origine, 1989-1995
Table 4: Legionellosis among European tourists in Spain. Cases and annual mean rates by country of origin, 1989-1995

		Taux moyen annuel / Annual mean rate	
	Nombre de cas /	(cas pour 100 000 touristes européens /	
	Number of cases	cases per 100 000 European tourists)	
Pays d'origine		Taux / Rates	I.C. 95% / 95% C.I.
Country of origin			
Suède			
Sweden	31	2.52	(0-9.20)
Danemark			
Denmark	15	1.60	(0-8.89)
Royaume Uni			
United Kingdom	184	1.12	(0.33-2.10)
Hollande			
Holland	24	0.94	(0-3.96)
Norvège			
Norway	7	0.73	(0-13.99)
Allemagne			
Germany	9	0.06	(0-0.38)
Autre			
Other	5	0.01	(0-0.20)
TOTAL	275	0.28	(0.16-0.65)

Discussion

Cases of legionellosis among European visitors to Spain show a similar age and sex distribution as reported elsewhere (6).

The differences in rates of legionellosis between travellers from different European countries to the same region is remarkable (table 5), and suggests the existence of an information bias, due to differences in national surveillance systems or degrees of participation in the European system. We were unable to adjust rates we calculated for country of residence for lack of appropriate denominators distributed by age and sex.

Tableau 5 : Légionelloses chez des touristes européens en Espagne. Taux pour 100 000 visiteurs, par pays d'origine et par région visitée, 1989-1995
Table 5: Legionellosis among European tourists in Spain. Rates per 100 000 visitors, by country of origin and region visited, 1989-1995

		Suède /	Danemark /	Royaume Uni /	Hollande	Norvège /	Allemagne /
		Sweden	Denmark	United Kingdom	Holland	Norway	Germany
Région de Valence /	Taux / Rates	-	-	2.01	1.77	-	-
Valencian region	I.C. 95% / 95% C.I.	-	-	0-7.02	0-33.70	-	-
Iles Baléares /	Taux / Rates	6.32	2.77	1.12	0.25	10.34	0.07
Balearic Isles	I.C. 95% / 95% C.I.	0-42.99	0-26.17	0-2.8	0-13.11	0-127.40	0-0.79
Catalogne /	Taux / Rates	2.03	0.41	2.07	1.69	1.34	-
Catalonia	I.C. 95% / 95% C.I.	0-21.61	0-21.40	0-7.46	0-9.39	0-70.04	-
Iles Canaries /	Taux / Rates	24.77	11.83	3.54	36.77	-	0.30
Canary Islands	I.C. 95% / 95% C.I.	0-233.81	0-321.87	0-18.11	0-84.50	-	0-8.254
Andalousie /	Taux / Rates	1.06	1.05	0.92	0.05	-	0.05
Andalusia	I.C. 95% / 95% C.I.	0-28.96	0-28.73	0-3.88	0-1.50	-	0-2.71

The crude rates showed that tourists visiting the Balearic Isles and the Valencian Region were the most greatly affected. As above, adjusted rates could not be calculated .

The high proportion of hotels associated with more than one case plus the appearance in many such establishments of patients in successive years suggested that their control measures are inadequate.

Recommendations

The results obtained highlight the need for EWGLI to adopt stricter case reporting criteria, especially with regard to the dates when cases stayed at particular places of accommodation, and dates of onset of symptoms, and the compatibility of those dates with the incubation period of legionellosis. Countries where the disease is diagnosed need to investigate risk factors more thoroughly and forward detailed information to the countries in which cases have travelled. Countries associated with the appearance of cases should monitor the maintenance of control measures over time, particularly in hotels repeatedly associated with cases. ELSS program records should be updated continually, by filing epidemiological and environmental data of interest. We would argue that all accommodation shown by subsequent investigation to be irrelevant to the development of the disease should be deleted from the registry. Similarly, if a patient has stayed at several establishments and environmental studies enable the case to be linked with just one of these, the establishments no longer under suspicion should be removed from the register.

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