Infectious Diseases in Finland

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INFECTIOUS DISEASES IN FINLAND 2005

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1 INTRODUCTION

In 2005, the National Infectious Diseases Register focused on developing the data management of its microbial strain collection, which consists of microbial strains submitted to the National Public Health Institute's reference laboratories in accordance with the Communicable Disease Decree. The confirmation, typing and susceptibility results are now more rapidly available for use of the Register via an encrypted connection in hospital districts and health centres, and the data are also promptly updated in the service available to the public on the Internet. Feedback about the strains to each laboratory was also developed.

The proportion of findings notified electronically by the laboratories to the National Infectious Diseases Register rose to 90 per cent. Electronic notifications are loaded immediately in the register database, which means faster availability of data compared with notifications submitted on paper. In general, electronic notifications are also more complete than notifications in paper form.

In May 2005, the European Center for Disease Control of the European Union began its work as an expert agency that manages the surveillance and control of infectious diseases. Even though the agency did not implement surveillance in 2005, in coming years its new surveillance strategy will considerably alter the ways of surveillance of infectious diseases in the EU. The rapidly expanding ECDC took a very active role in coordinating pandemic preparedness between the EU member states.

1.1 General epidemiological situation in 2005

Among respiratory infections, the number of RSV cases notified in 2005 was clearly the highest since the beginning of the National Infectious Diseases Register in 1995. The seasonal influenza epidemic was relatively limited. There were only very few cases of whooping cough, which was in line with the cyclical annual variation of the disease. The revised childhood vaccination programme was implemented from the beginning of the year, and the composition of the whooping cough vaccine and the vaccination age changed. However, it is unlikely that this could have had such a distinct immediate effect on the epidemiology of whooping cough.

Among intestinal infections, the number of salmonella infections, the majority acquired abroad, is beginning to increase again. The EU has recently issued new, considerably stricter objectives concerning the occurrence of salmonella in livestock and products. This will hopefully be reflected in the number of salmonella infections brought to Finland from abroad by Finnish travellers. The number of notified campylobacter infections, 4,000, was record high. More than two thirds of campylobacter infections with travelling information were associated with travel abroad. Campylobacter infections also involve chronic complications. Therefore there is a need for new and more efficient approaches to the prevention of campylobacter infections. There were many outbreaks of intestinal diseases. With regard to geographical extent, challenges of investigation and international impact, the most noteworthy one was the Salmonella typhimurium var copenhagen outbreak. The outbreak was transmitted by iceberg lettuce, and its origins were traced all the way to the Spanish farm that had grown the lettuce.

Hepatitis A cases nearly disappeared. Their number (26) was clearly the lowest in the surveillance history of the National Infectious Diseases Register: only six domestic cases were notified, while only a few years ago the number of domestic cases was several hundred. There were only a few cases of acute hepatitis B. As the number of notified new hepatitis C findings, which are almost always associated with the use of injecting drugs, also remained clearly below the figures reported at the turn of the millennium, it is evident that expanding hepatitis A and B vaccinations to injecting drug users and providing low-threshold counselling services, including needle and syringe exchange programmes, have proved very efficient in fighting hepatitis.

The number of HIV infections did not change from the preceding years, and the proportion of injecting drug users was low. The proportion of immigrants rose to 40 per-cent. The number of notified chlamydia infections remained high, about 13,000 cases. This indicates a remarkable burden of chronic complications in the population. The prevention of sexually transmitted diseases should be reinforced by enhancing cooperation between various organisations.

The number of tuberculosis cases rose eight per cent from the previous year, after a long downward trend. Last time the long downward trend was broken nearly 10 years ago, in 1998. In children and adolescents, the number of cases remained low, and *Mycobacterium tuberculosis* strains showed trend towards reduced susceptibility. *Mycobacterium bovis* BCG is used in the BCG vaccine, and laboratory findings of the bacterium were again more frequent compared with the situation before the year 2002, when the product preparation was changed, reflecting the vaccine's

side effects. A new national tuberculosis control programme was introduced in autumn 2006 to meet the new challenges of controlling tuberculosis.

Among the most important antimicrobial-resistant bacteria, the frequency of findings of new methicillin-resistant *Staphylococcus aureus* (MRSA) cases stabilised, but the situation is still alarming. The number of findings of vancomycin-resistant enterococci (VRE) increased manyfold, but their occurrence was geographically restricted. The proportion of resistant pneumococcal strains causing invasive infections remained the same. Even though the resistance situation in Finland is still relatively good among the European countries, it has clearly taken a turn to an unfavourable direction compared with the other Nordic countries. More efficient preventive measures are required to reverse this development.

The number of Lyme borreliosis cases was the highest in the history of the National Infectious Diseases Register.

No domestic cases of measles, mumps or rubella (the MPR diseases) have been reported in 10 years. This is firm evidence of the efficiency of the Finnish vaccination programme. The only case of invasive *Haemophilus influenzae* type b (Hib) infection detected in vaccinated age cohorts was diagnosed in a child of foreign birth; the child's vaccination history remained unclear.

In 2005, the number of *Streptococcus agalactiae* (streptococcus Group B) cases increased markedly from the preceding years. The increase was most noticeable in small children. This gives cause for thorough assessment of the options for strategies that use antimicrobials to

prevent serious streptococcus B infections in newborn babies. Development of a vaccine to prevent serious streptococcus B infections in infants is also under way.

Helsinki 16 October 2006

Petri Ruutu

Research Professor

2 RESPIRATORY INFECTIONS

2.1 Influenza A

After the first cases, diagnosed as early as in October–November 2004, the epidemic had a slow start, spreading first in garrisons (peak of findings in mid-February 2005) and then among civilians (with the peak occurring as late as the end of March). More than 15 per cent of the findings in 2005 were notified in April or later. In June–September, only four findings were reported (all in June), which was clearly below the level of some previous years. In Finland, the dominant virus of the season belonged to the A/H3N2 subtype. The slow development and relatively limited size of the epidemic can be explained by the population's basic immunity. The virus belonged to the A/Wellington/1/2004 type viruses that were already found in Finland in winter 2003–2004, even though it was not optimally antigenically related to the A/H3N2 virus (A/Wyoming/1/2003) used in the influenza vaccine in autumn 2004. Some of the viral strains that were analysed in more detail at the National Public Health Institute were similar to the A/California/7/2004 strain that was chosen as the H3N2 virus for the autumn 2005 vaccine. If the overrepresentation of conscripts in the sample material is eliminated, under-five-year-olds and over-75-year-olds were the age groups with the highest number of notified virological findings, which is typical of A/H3N2 epidemics. The clinically most serious cases also concentrated in these age groups. The low frequency of findings in summer and autumn 2005 may have reflected the low number of transmission chains in the intervening period. It may also have been one reason behind the late start of the H3N2 epidemic in the following season; in October–December

2005, only two influenza A findings were notified to the National Infectious Diseases Register.

In addition to A/H3N2 viruses, single cases of A/H1N1 were confirmed at the National Public Health Institute. The virus causes epidemics mainly in children, and antigenically it was similar to the A/New Caledonia/20/99 virus, which has been circulating the world for a long time and was included in the autumn 2004 vaccine.

2.2 Influenza B

The epidemic was small. The peak occurred in March–April, and the last cases were detected in June. Only the hospital districts of Varsinais-Suomi and Helsinki and Uusimaa notified tens of cases to the National Infectious Diseases Register. The cases notified to the National Infectious Diseases Register were distributed evenly in all age groups instead of concentrating in under-fiver-year-olds and over-75-year-olds, which would be characteristic for A/H3N2 viruses. There are two developmental branches of B viruses circulating in the world, and all viral strains that were analysed in detail at the National Public Health Institute belonged to the B/Yamagata/16/88 viral branch, bearing relatively high antigenic and genetical similarity to the autumn 2004 vaccine virus B/Jiangsu/10/2005, which belongs to the same branch.

2.3 RSV (Respiratory Syncytial Virus)

In 2005, the number of RSV cases diagnosed by laboratory tests was the highest in the history of the surveillance performed by the National Infectious Diseases Register: 2,330 cases (45/100,000). The previous peak with 1,953 cases was

observed in 1997. In Finland, RSV follows a regular two-year pattern; in uneven years there is a minor epidemic in the spring, with a more intense epidemic in the following winter. This was also the case in 2005. The spring peak occurred in May, and a stronger than usual winter epidemic peaked in December.

The variation in incidence by hospital district (17–59/100,000) was smaller than in the preceding years. The variation is probably caused by differences in the use of laboratory diagnostics. Immunochromatographic blood testing has become more common in clinical work with patients. The cases that are diagnosed by these rapid tests are not recorded in the National Infectious Diseases Register statistics. RSV infections occur in all age groups, but cases leading to hospitalisation and, subsequently, laboratory diagnostics, concentrate in babies and small children. Of the notified RSV findings, 96 per cent were diagnosed in the age group of 0–4-year-olds. (Figure 1.)

2.4 Whooping cough (*Bordetella pertussis*)

There were 522 notified cases of laboratory-confirmed whooping cough (11/100,000), which is clearly below the figures of the two preceding record years (1,264 cases in 2003 and 1,631 in 2004). In the majority of cases, diagnosis was based on an antibody finding. The reduction could be due to a cyclical variation of incidence that is characteristic for whooping cough and has a 2–3-year cycle. On the other hand, the booster vaccinations to schoolchildren that were introduced in recent years may have reduced the force of infection in the population. It can be expected that in the next few years the epidemiological situation of whooping cough in Finland will change as a result of booster vaccinations administered to 6-year-olds

since 2003 and the new vaccination programme implemented from 1 January 2005, according to which booster vaccinations are administered to 4- and 14-year-olds.

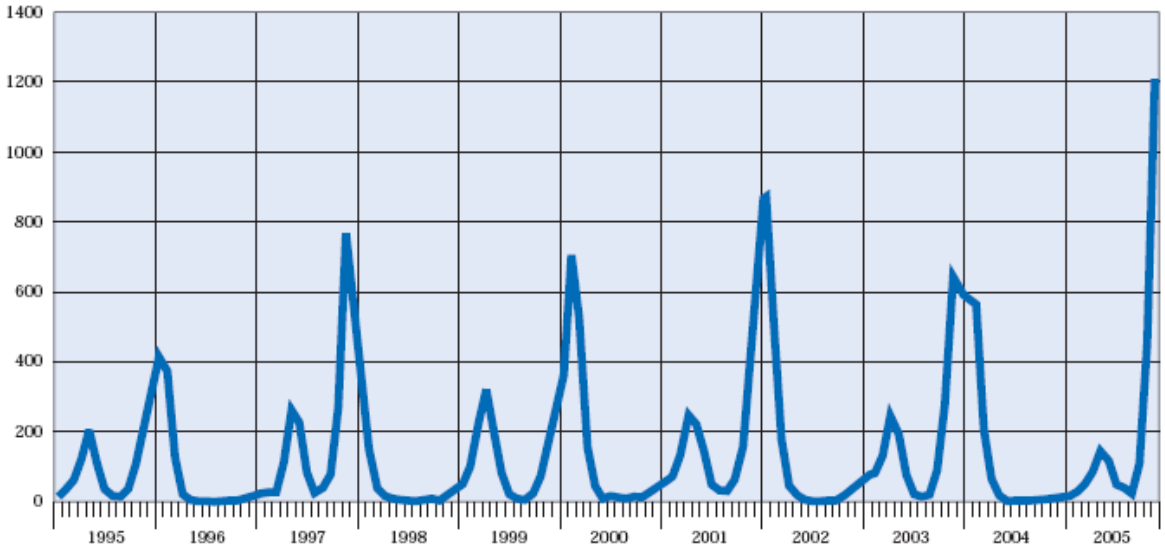


Figure 1. RSV (Respitory syncytial virus) by month 1995-2005

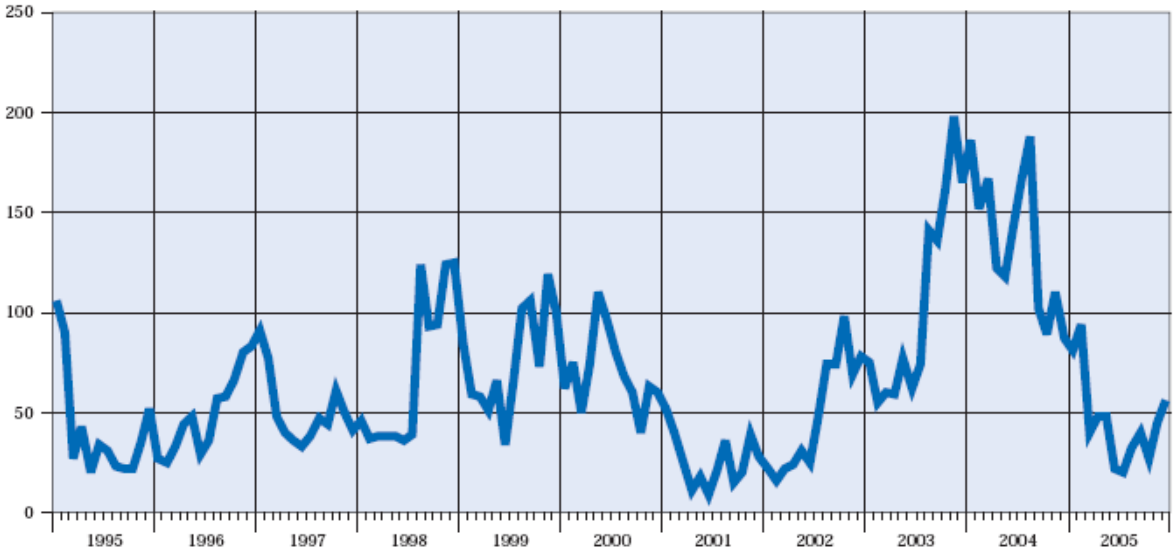


Figure 2. Whooping cough (*Bordetella pertussis*) by month 1995-2005

In quiet years there have been 11–32 findings per year in children under 12 months of age, while in 2005 the number was 44 (8%). Half of these were diagnosed in unvaccinated infants under three months of age. The population groups that are susceptible to the disease should be monitored closely in the next few years, as one of the main objectives of the new vaccination programme is to reduce occurrence in infants. As previously, schoolchildren were the largest group, and slightly more than 25 per cent of the cases were over 20 years old. There was remarkable variation in the incidence between hospital districts. The incidence was highest in the Etelä-Savo hospital district (44/100,000), while Itä-Savo was the only hospital district without a single notified case. (Figure 2.)

2.5 Legionella

Based on laboratory notifications, there were 25 legionella infections in 2005. In five cases, the diagnosis was based on demonstration of antigen in urine, and the rest were based on serological methods. In further investigations it was observed that in only 12 cases was the clinical picture consistent with legionellosis, that is, the patient had clinically or radiologically diagnosed pneumonia. All five patients whose legionella could be demonstrated by urinary antigen test had pneumonia. The other cases whose disease was interpreted as legionellosis had either a single high antibody titre or a diagnostic rise in legionella antibodies. In one case, legionella grew in the blood without diagnosed pneumonia. The patient was a 69-year-old woman with a severe underlying disease, and she died of legionella sepsis. Another

patient, a 73-year-old woman, also died of legionellosis.

Eight of the cases were men and four were women. Their age ranged from 18 to 73 years.

About half of the legionellosis patients had been abroad prior to falling ill. The accommodation data of these patients were reported to EWGLINET (the European Surveillance Scheme for Travel Associated Legionaires Disease), which collects data on travel-associated cases of legionellosis. This way, cases that occur in citizens of different countries and are associated with the same accommodation facility can be detected rapidly, and preventive measures can be taken, when necessary.

3 INTESTINAL INFECTIONS

3.1 Salmonella

In 2005, the number of notified salmonella cases totalled 2,503 (2,265 in 2004). Of these, 2,490 did not belong to serotypes Typhi and Paratyphi, which is about 200 cases more than in 2004. Thus, the decreasing trend that had continued in Finland for a long time was reversed. This applied both to cases acquired domestically and abroad. Men accounted for 43 per cent of the cases and women for 57 per cent. The annual incidence in the whole country was 47 cases per 100,000 population. The incidence was highest in the hospital districts of Itä-Savo (67/100,000) and Helsinki and Uusimaa (59/100,000) and lowest in the hospital districts of Länsi-Pohja (20/100,000) and Pohjois-Pohjanmaa (27/100,000). The incidence was highest (more than 55/100,000) in 20–54-year-olds and lowest (12/100,000) in over-75-year-olds.

The most common *Salmonella* serotypes were Enteritidis (956 cases), Typhimurium (452), Stanley (121), Virchow (94), Corvallis (64) and Agona (64). (Table 1.)

Table 1. The most common serotypes of Salmonella cases 1995-2005 (S. Typhi and S. Paratyphi not included)

	1995		1996		1997		1998		1999		2000
Domestically acquired infections											
Salmonella Enteritidis	378	Salmonella Typhimurium	203	Salmonella Typhimurium	499	Salmonella Typhimurium	222	Salmonella Typhimurium	375	Salmonella Typhimurium	124
Salmonella Typhimurium	279	Salmonella Enteritidis	104	Salmonella Enteritidis	79	Salmonella Newport	66	Salmonella Agona	85	Salmonella Enteritidis	52
Salmonella Stanley	95	Salmonella Infantis	29	Salmonella Hadar	31	Salmonella Enteritidis	59	Salmonella Enteritidis	83	Salmonella Agona	27
Salmonella Infantis	73	Salmonella Poona	17	Salmonella Infantis	24	Salmonella Saintpaul	22	Salmonella Hadar	10	Salmonella Hadar	17
Salmonella Panama	26	Salmonella Stanley	15	Salmonella Newport	22	Salmonella Infantis	21	Salmonella Poona	10	Salmonella Virchow	15
others	161	others	98	others	126	others	121	others	93	others	90
total	1012		466		781		511		656		325
Infections acquired abroad											
Salmonella Enteritidis	971	Salmonella Enteritidis	960	Salmonella Enteritidis	912	Salmonella Enteritidis	944	Salmonella Enteritidis	892	Salmonella Enteritidis	1046
Salmonella Typhimurium	127	Salmonella Typhimurium	171	Salmonella Typhimurium	159	Salmonella Typhimurium	133	Salmonella Hadar	112	Salmonella Typhimurium	204
Salmonella Infantis	111	Salmonella Virchow	144	Salmonella Virchow	85	Salmonella Virchow	82	Salmonella Typhimurium	103	Salmonella Hadar	125
Salmonella Virchow	75	Salmonella Hadar	65	Salmonella Hadar	57	Salmonella Hadar	79	Salmonella Virchow	76	Salmonella Braenderup	49
Salmonella Hadar	48	Salmonella Infantis	60	Salmonella Newport	34	Salmonella Infantis	67	Salmonella Braenderup	38	Salmonella Virchow	49
others	827	others	867	others	733	others	827	others	680	others	747
total	2159		2267		1980		2132		1901		2220
Country of acquisition not specified											
number of cases	144		140		231		301		476		223
Total	3315		2873		2992		2944		3033		2768

	2001		2002		2003		2004		2005
Domestically acquired infections									
Salmonella Typhimurium	152	Salmonella Typhimurium	224	Salmonella Typhimurium	137	Salmonella Typhimurium	130	Salmonella Typhimurium	240
Salmonella Enteritidis	63	Salmonella Enteritidis	42	Salmonella Enteritidis	61	Salmonella Enteritidis	81	Salmonella Enteritidis	74
Salmonella Agona	41	Salmonella Hvittingfoss	26	Salmonella Newport	16	Salmonella Agona	27	Salmonella Agona	32
Salmonella Infantis	19	Salmonella Agona	16	Salmonella Agona	12	Salmonella Stanley	7	Salmonella Infantis	10
Salmonella Ohio	12	Salmonella Abony	15	Salmonella Poona	9	Salmonella Newport	7	Salmonella Stanley	5
others	103	others	86	others	75	others	81	others	80
total	390		409		310		333		441
Infections acquired abroad									
Salmonella Enteritidis	1238	Salmonella Enteritidis	905	Salmonella Enteritidis	887	Salmonella Enteritidis	757	Salmonella Enteritidis	832
Salmonella Typhimurium	139	Salmonella Typhimurium	115	Salmonella Typhimurium	155	Salmonella Typhimurium	182	Salmonella Typhimurium	194
Salmonella Hadar	96	Salmonella Hadar	69	Salmonella Stanley	67	Salmonella Stanley	105	Salmonella Stanley	113
Salmonella Virchow	79	Salmonella Stanley	64	Salmonella Virchow	67	Salmonella Virchow	74	Salmonella Virchow	87
Salmonella Stanley	62	Salmonella Virchow	55	Salmonella Hadar	58	Salmonella Newport	53	Salmonella Corvallis	60
others	757	others	637	others	628	others	665	others	654
total	2371		1845		1862		1836		1940
Country of acquisition not specified									
number of cases	145		103		107		86		109
Total	2906		2357		2279		2255		2490

Serotype *S.* Typhi caused eight, *S*. Paratyphi A two and *S.* Paratyphi B three cases. All cases of typhoid and paratyphoid where the patient's travel data were available were acquired abroad.

Of salmonella cases, 441 (18%) were acquired in Finland and 1,928 (78%) abroad. No country of acquisition was specified for 110 cases (4%). The total number of domestic cases was 38 per cent higher than in 2004 (320 cases), and their incidence was 8.4/100,000 inhabitants. The majority (245 cases, 56%) of domestic cases were caused by serotype *S*. Typhimurium, and the most common phage types were FT 1 (35%) and FT 104B (27%, see Outbreaks below). The second most common serotype in domestic cases was *S.* Enteritidis (73 cases). Serotype Enteridis is not known to have a permanent reservoir in Finland's livestock. However, its phage type FT 8 was considerably more common in domestic cases than in cases of foreign origin (37% *vs.* 7%), which would suggest a domestic source or imported food (see Outbreaks below).

The incidence of salmonella cases acquired abroad was 37/100,000 population. Serotype *S*. Enteritidis caused 832 (43%) of the cases with foreign origin. In these, the most common phage types were FT 4 (29%), FT1 (21%) and FT 21 (14%). The next most common serotypes acquired abroad were Typhimurium (194 cases), Stanley (110), Virchow (87) and Corvallis (54). The most frequent phage types of Typhimurium cases acquired abroad were FT NST (28%; not specific type) and FT 104 (18%). The most common countries of acquisition were Thailand, Bulgaria, Spain, Egypt and Estonia, each with more than a hundred notified cases.

Nalidixic acid is used in epidemiological susceptibility testing, and data on resistance to nalidixic acid can be used to predict reduced susceptibility (MIC ≥ 0.125 mg/L) to fluoroquinolones. Twenty-nine per cent of strains acquired abroad were resistant to nalidixic acid. Eighty per cent of these showed reduced susceptibility to ciprofloxacin and two per cent were fully resistant (MIC ≥ 4.0 mg/L). The corresponding figures in domestic strains were: 7, 61 and 0 per cent.

3.2 EHEC

Twenty-one microbiologically confirmed cases of enterohaemorrhagic *Escherichia coli* (EHEC) were notified to the National Infectious Diseases Register (0.4/100,000/year). The number was slightly above the figures observed in recent years. Twelve cases were in women and nine were in men. Fourteen cases were under 15 years old, five of them 0–4-year-olds. Only in two cases the disease had been acquired abroad.

Serogroup O157 strains caused 15 cases, and ten of these were caused by the same, rare sorbitol-positive, immotile O157:H$^-$ clone. The O157:H$^-$ cases occurred in six families in different parts of Finland. Seven of the cases were children of 1 to 11 years of age, and three were adults. In four children, the infection resulted in HUS syndrome. Despite thorough interviews, a common source of infection was not found, and the patients had not been abroad prior to falling ill. There was also one O157:H$^-$ case of foreign origin diagnosed during the period, but the isolated strain differed microbiologically from the abovementioned group. Serotype O157:H7 strains caused four domestic cases as a family cluster and a single case.

Of all the EHEC cases, six were caused by an EHEC non-O157 serogroup, five of these of domestic origin. Among the domestic EHEC non-O157 cases four were caused by the common O103:H2 serotype in two different families. In addition, there were two separate cases caused by other non-O157 groups, one of them of foreign origin.

3.3 Campylobacter

In 2005, there were 4,002 campylobacter cases notified to the National Infectious Diseases Register, which is a record figure. This was a 12% increase from 2004. The incidence in the entire population was 76/100,000. Men constituted 53 per cent of the cases. Notified cases were most common in 20–49-year-olds, with an incidence of 120/100,000. The hospital district with clearly the highest incidence was HUS (119/100,000). Incidence was lowest in the Länsi-Pohja (33/100,000) and Keski-Pohjanmaa (39/100,000) hospital districts. The seasonal variation was characteristic for campylobacter, with the highest incidence clearly in July–August.

In 2,961 cases (74%) information was obtained of recent travelling abroad. Seventy-one per cent of these had been abroad just prior to becoming ill. The most common countries of acquisition were Turkey (218 cases), Spain (178), Thailand (154), Bulgaria (149) and India (149). (Figure 3.)

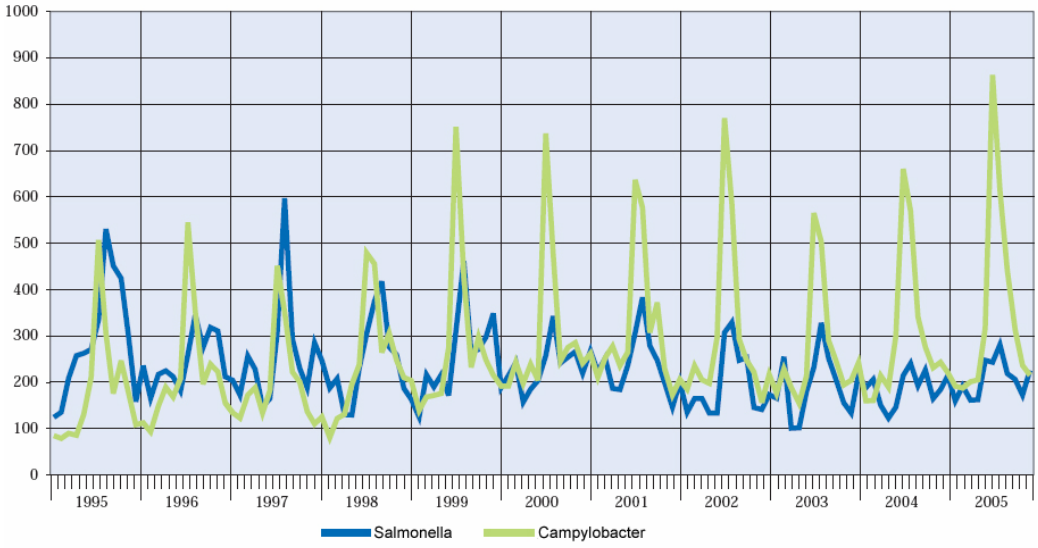


Figure 3. Salmonella and Campylobacter cases by month 1995-2005

3.4 Yersinia

The total number of *Yersinia enterocolitica* cases did not change from 2004 (550) to 2005 (543). However, the percentage of culture positive *Y. enterocolitica* cases rose from 74 (2004) to 83 (2005). In the country as a whole, incidence was 10 per 100,000 population. The incidence was highest in the hospital districts of Helsinki and Uusimaa (20), Kainuu (18) and Keski-Suomi (13), and clearly smallest in the Pirkanmaa hospital district (2). (Figure 4.)

The number of *Yersinia pseudotuberculosis* cases decreased markedly from 2004 (131) to 2005 (79), which is largely explained by a *Y. pseudotuberculosis* outbreak in Pohjanmaa in 2004. Incidence per 100,000 inhabitants was small in the country as a whole (less than 2), being the highest in the Helsinki and Uusimaa hospital district (4). Several hospital districts had no diagnosed cases. Compared with previous years, 2005 was also exceptional because of the high proportion, 86 % of *Y. pseudotuberculosis* cases detected by antibody analysis. (Figure 5.)

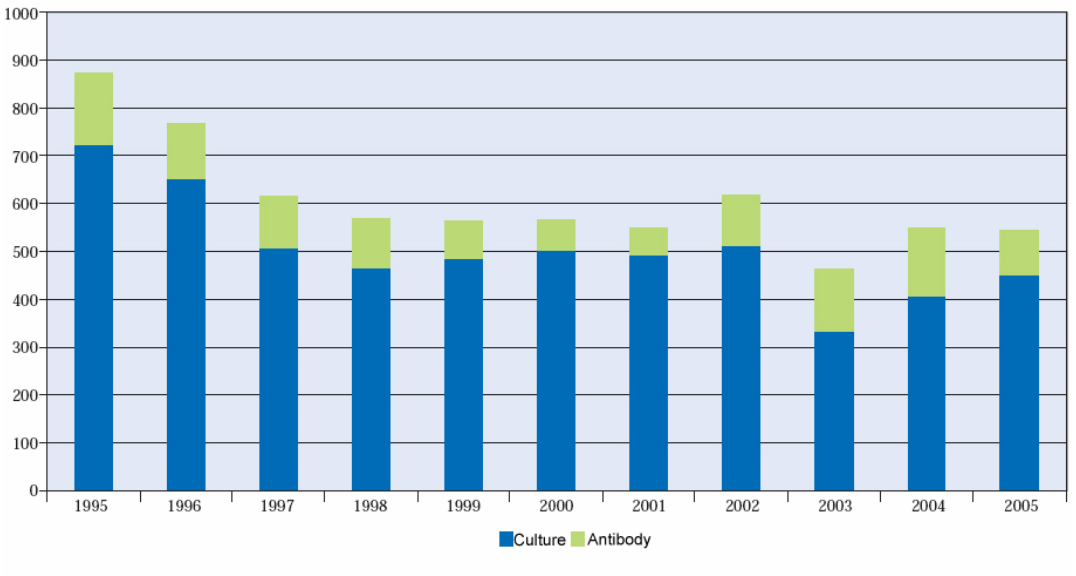


Figure 4. *Yersinia enterocolitica* findings 1995-2005

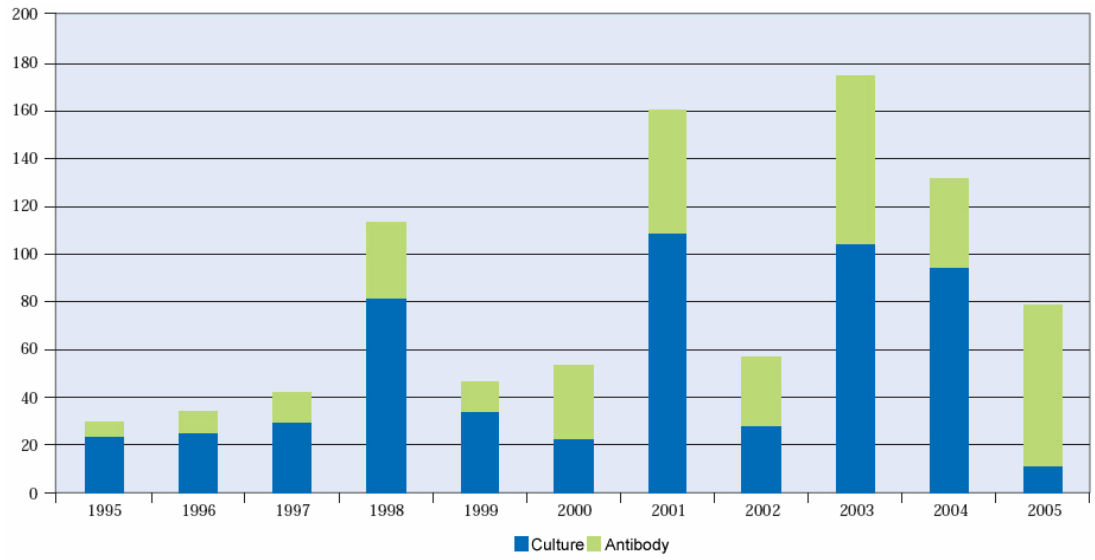


Figure 5. *Yersinia pseudotuberculosis* findings 1995-2005

4 INTESTINAL INFECTION OUTBREAKS

In 2005, the National Public Health Institute received 79 notifications of suspected food- or water-borne outbreaks. This exceeded slightly the previous year's figure, which was 67.

In 2005, there were two major water-borne campylobacter outbreaks and two salmonella outbreaks that led to extensive investigations. Several other intestinal infection clusters were also identified.

4.1 Campylobacter jejuni outbreak in Espoo

In June–July, more than 100 people contracted diarrhoea in the Rinnekoti area in Espoo. The patients included both employees and residents of the Rinnekoti Institution. *Campylobacter jejuni* was found in seven patients. According to a questionnaire study, drinking tap water in the Rinnekoti area doubled the risk of illness, even though the result was not statistically significant.

The water utility of Rinnekoti receives its raw water from three ponds. The cleaning process involves precipitation, settling, filtering and chlorination. There was a sewage leak and a blockage in the sewerage system at the end of May. In addition, on 16 June renovated and new lines were connected, and on 28 June a leak was detected in the vicinity of the sewage treatment plant. No campylobacter could be

demonstrated in the water samples, but some coliforms were detected. Based on the investigation, it was assumed that the outbreak spread via tap water. This is also supported by the observation that the number of cases fell rapidly after the request to boil tap water.

4.2 *Campylobacter jejuni* outbreak in Tohmajärvi

In June–July ten persons in Tohmajärvi contracted an infection caused by hippurate-negative campylobacter. The strains could not be typed by serotyping, and a more detailed species identification showed that instead of *C. coli*, the cause of the outbreak was a rare hippurate-negative *C. jejuni*.

4.3 *Campylobacter jejuni* outbreak in Vihti

In October, Vihti experienced a campylobacter outbreak with some 600 people contracting gastrointestinal illness between mid-October and 10 November. The incidence was clearly highest in the Nummela area, where the water utility's water tower is located. During the outbreak, 117 stool samples were taken, and Campylobacter jejuni grew in 32 of these. No campylobacters were detected in water samples, but the samples taken from the Nummela water tower contained coliforms and enterococci of intestinal origin. Investigations at the water utility revealed that there were two dead squirrels in the upper part of the water tower, and at the bottom of the tower there were several dead squirrels in an advanced state of decomposition. The squirrels had apparently found their way into the water tower through a broken air conditioning pipe. The squirrels found on the surface were examined,

and *Campylobacter jejuni* was isolated from their intestinal tract. Nine patient strains were serotyped, and they were all found to be of the same serotype. In addition, both patient strains and the squirrel strains were examined by pulsed field electrophoresis. All strains were identical.

In 2001, there had been another water-borne campylobacter outbreak in Vihti. After that, all water intake plants were provided with UV disinfection equipment to prevent further problems. However, the epidemic of 2005 shows that contamination may also occur in other parts of the water utility, and this should be kept in mind during maintenance and overhaul.

4.4 *Salmonella* Typhimurium var copenhagen in Oulu

In January, four people who had dined at the same restaurant in Oulu were diagnosed with salmonellosis caused by the *Salmonella* Typhimurium FT 40 strain. The source of infection could not be detected, but the restaurant's hygiene was found lacking in several ways. The same restaurant had been associated with salmonella infections (serotype Enteritidis) also in October 2004. This phage type has also been observed in wild animals and, occasionally, in pigs and poultry.

4.5 *Salmonella* Agona in Mänttä and the Imatra region

In February–March, nine *Salmonella* Agona infections were observed in the Mänttä–Vilppula region, and thorough interviews were used to discover the source of infection. Nearly all patients had visited

the same grocery shop. Many food samples were taken at the shop, and the personnel's screening samples were analysed. However, the results were negative. Three further cases occurred in April–June. After a break of more than two months, 11 additional infections occurred in just over a month. These people were also interviewed, but the attempts to find a common source of infection, food or other, were unsuccessful. The DNA profiles of the *S*. Agona strains isolated from the patients were identical with each other. The number of *S*. Agona infections diagnosed in other parts of the country at that time was not higher than usual. In addition, in October–November five *S*. Agona infections were detected in Imatra with a DNA profile very close to the Mänttä strain. *S*. Agona clusters were also observed in France in January–February and in Ireland in September. The possible association of these infections with the Finnish ones was investigated, but the DNA profiles of the strains were clearly different.

4.6 Extensive *Salmonella* Typhimurium var copenhagen outbreak

Multiresistant *Salmonella* Typhimurium var copenhagen, phage type FT 104B, caused an outbreak of food poisoning in Southeast and Western Finland in May 2005. There were 70 microbiologically confirmed cases. About half of these occurred in Southeast Finland and half in Western Finland. The DNA and antibiotic resistance profiles of the patient strains were identical with each other.

The outbreak manifested first in mid-May at the Lappeenranta Social and Health Care Institute, which has about 800 students and teachers. In accordance with a self-monitoring programme, the school's lunch restaurant had stored food samples in the freezer on every school day. When the health supervision authorities performed an inspection, they received 19 food samples for

analysis. *Salmonella* Typhimurium var copenhagen FT 104B grew in three samples of salad that had been served on 10–12 May. The strain's phage type and genotype, as well as its antibiotic resistance profile, were identical with those of the patient strains.

Most of the people who fell ill in Western Finland had dined at the same restaurant in Pori on 13 or 14 May. There were no food samples available from the days in question, and later samples showed no signs of salmonella.

Tracing revealed that in May both the school's lunch restaurant and the restaurant in Pori had received iceberg lettuce from the same Spanish supplier. The Spanish authorities traced the origin of the salad all the way to the farm and reported to the EU. No negligence was reported concerning the growing conditions of the salad.

4.7 *Salmonella* Enteritidis FT 4 outbreak in visitors to Tallinn

In June–July, 65 Finns who had arrived from Tallinn were diagnosed with an infection caused by *Salmonella* Enteritidis phage type FT 4. All strains had reduced susceptibility to ciprofloxacin. Patients from ten different groups of travellers were interviewed, many of them had been hospitalised. The connecting factor was dining at a medieval restaurant in Tallinn. The restaurant's hygiene was found lacking. *S.* Enteritidis, which is identical with the patient strains in question with respect to phage type, genotype and susceptibility to antibiotics, is found in poultry in Estonia.

4.8 *Salmonella* Enteritidis FT 8 outbreak

In November–December, more than 20 cases of salmonellosis caused by *S.* Enteritidis phage type FT 8 were diagnosed in different parts of Finland in patients who had not been abroad prior to falling ill. The source of infection could not be

identified. In 2005, the phage type in question was often associated with a visit to the Czech Republic, Hungary or Bulgaria, occasionally also to Germany or Spain.

5 HEPATITIDES

5.1 Hepatitis A

In 2005, only 26 cases of hepatitis A were notified to the National Infectious Diseases Register (incidence 0.5/100,000). Fifteen of the cases were men and eleven were women. As many as 12 hospital districts had no diagnosed cases. There were no significant differences in the incidence between age groups. Sixteen of the infections had been acquired abroad, six in Finland, one either in Finland or Russia, and in three cases the country of acquisition was not reported.

After the 2002–2003 outbreaks relating to injecting drugs, hepatitis A cases have now returned to a level that is even lower than prior to the outbreaks, and the proportion of domestic infections is fairly low.

5.2 Hepatitis B

In 2005, only 32 cases of acute hepatitis B were notified to the Infectious Diseases Register. Hepatitis A and B vaccinations to risk groups have been included in the public vaccination programme. Health counselling and needle and syringe exchange services for injecting drug users have been reinforced. In 2004, the health counselling centres exchanged 1.8 million syringes and needles, and pharmacies sold about 0.5 million syringes and needles. The estimated number of injecting drug users in Finland is 16,000–20,000. (Table 2., Figure 6.)

Table 2. Acute Hepatitis B cases by mode of transmission 1995-2005 (The modes of transmission reported by physicians are shown in the table. From 1995 to 2005, there are four known cases of hepatitis B infections that were acquired from Finnish blood products)

	1998	1999	2000	2001	2002	2003	2004	2005
Injecting drugs	76	106	82	28	43	18	8	3
Sex	44	36	39	41	37	19	16	10
Perinatal	1	-	1	-	1	1	-	-
Blood products	4	1	1	1	1	-	3	-
Other	4	9	8	6	2	1	4	2
Unknown	117	103	108	51	92	67	27	17
Total	**246**	**256**	**239**	**127**	**176**	**106**	**58**	**32**

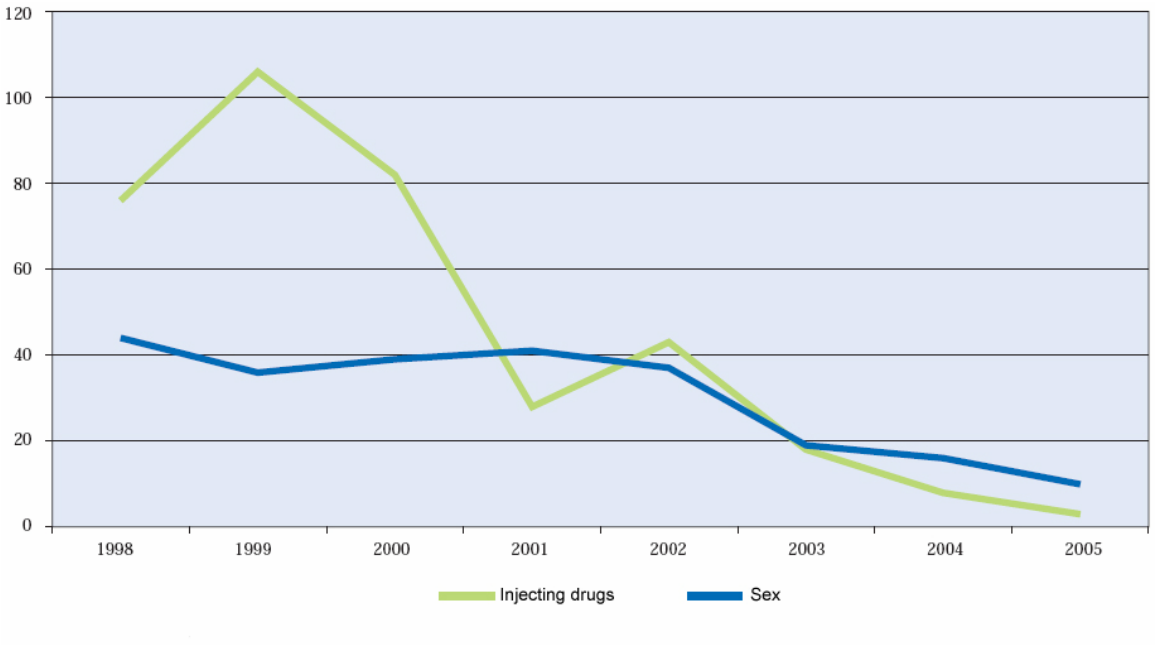


Figure 6. Acute Hepatitis B cases, injecting drugs and sex infections 1995-2005

5.3 Hepatitis C

The most favourable trend in hepatitis C cases can be seen in 15–19-year-olds. It is difficult to separate acute infections from those acquired years ago, and therefore the changes should be interpreted cautiously. The epidemiology of hepatitis C has also been monitored by targeted seroepidemiological studies. The National Public Health Institute has coordinated exit questionnaire and sampling surveys to injecting drug users at health counselling centres since 1998. According to the data from sampling surveys, the prevalence rate of hepatitis C in this group has fallen from more than 60 per cent in 1998 to about 50 per cent. The prevalence rate of Hiv in the same samplings has been less than 2 per cent. The results of anonymous testing and exit surveys indicate a strong connection between the duration of use and the proportion of users with hepatitis C infection. (Table 3., Figure 7.)

The modes of transmission reported by physicians are shown in the table. Since 2000, no hepatitis C infections are known to have been acquired from Finnish blood products. (Figure 7., Table 3.)

Table 3. Hepatitis C cases by mode of transmission 1995-2005 (The modes of transmission reported by physicians are shown in the table. Since 2000, no hepatitis C infections are known to have been acquired from Finnish blood products)

	1998	1999	2000	2001	2002	2003	2004	2005
Injecting drugs	1019	986	920	814	693	625	595	604
Sex	54	34	39	41	46	46	60	61
Perinatal	4	10	6	3	3	1	10	5
Blood products	24	22	24	18	18	22	18	24
Other	24	40	30	31	28	34	31	34
Unknown	678	660	720	583	582	535	523	507
Total	**1803**	**1753**	**1739**	**1491**	**1371**	**1264**	**1237**	**1236**

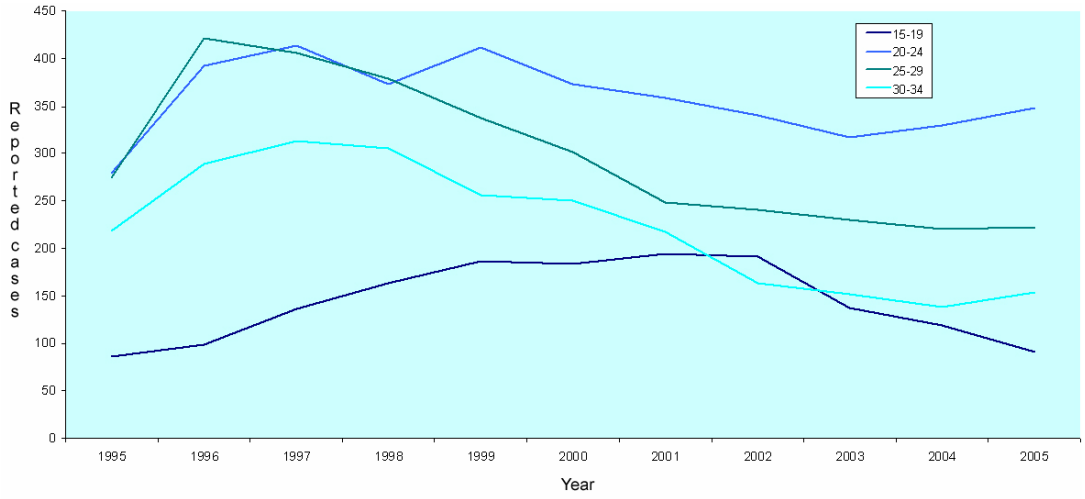


Figure 7. Reported Hepatitis C cases according to age 1995-2005

6 SEXUALLY TRANSMITTED DISEASES

6.1 Chlamydia (*Chlamydia trachomatis*)

The number of chlamydia cases seems to have stabilised in recent years. In 2005, a little less than 13,000 cases of chlamydia were diagnosed (incidence 244/100,000 inhabitants), which is slightly lower than in 2004 but about similar to the figure of 2003. As earlier, the incidence was highest in the hospital districts of Ahvenanmaa (366/100,000 population) and Lapland (370/100,000).

Sixty per cent of the cases were women. The majority of cases were diagnosed in 15–24-year-old women and 20–24-year-old men. As earlier, the proportion of under 20-year-olds was considerably higher in women than in men (33% and 13%, respectively). (Figure 8.)

6.2 Gonorrhoea (*Neisseria gonorrhoeae*)

The number of gonorrhoea cases was at the same level as in previous years. Nearly 250 cases of gonorrhoea were notified to the National Infectious Diseases Register, more than 80 per cent of them in men.

The country of acquisition was reported in 80 per cent of cases in men. In 39 per cent of cases with an identified country of acquisition it was other than Finland: 36 (23%) infections had been acquired in the Far East and 18 (11%) in Russia or Estonia. Eight of infections in women were reported to have been acquired abroad. (Table 4.)

6.3 Syphilis (*Treponema pallidum*)

The number of syphilis cases (147) had risen slightly from the three preceding years (109–133 cases per year). The incidence was highest in the hospital districts of Etelä-Savo, Kymenlaakso, Etelä-Karjala, Kainuu and Helsinki and Uusimaa. A quarter of the reported cases were diagnosed in over-70-year-olds, the majority of which are probably serological scars due to an infection in the past.

More than half of the cases were diagnosed in men, like in previous years. The country of acquisition was reported in 55 per cent of cases in men, and in 70 per cent of these the infection had been acquired abroad, most often in Russia (36%). The importance of Russia as the country of acquisition has diminished. The country of acquisition was known in 40 per cent of cases in women. Forty per cent of the infections were acquired in Finland and equally many in Russia. (Table 5.)

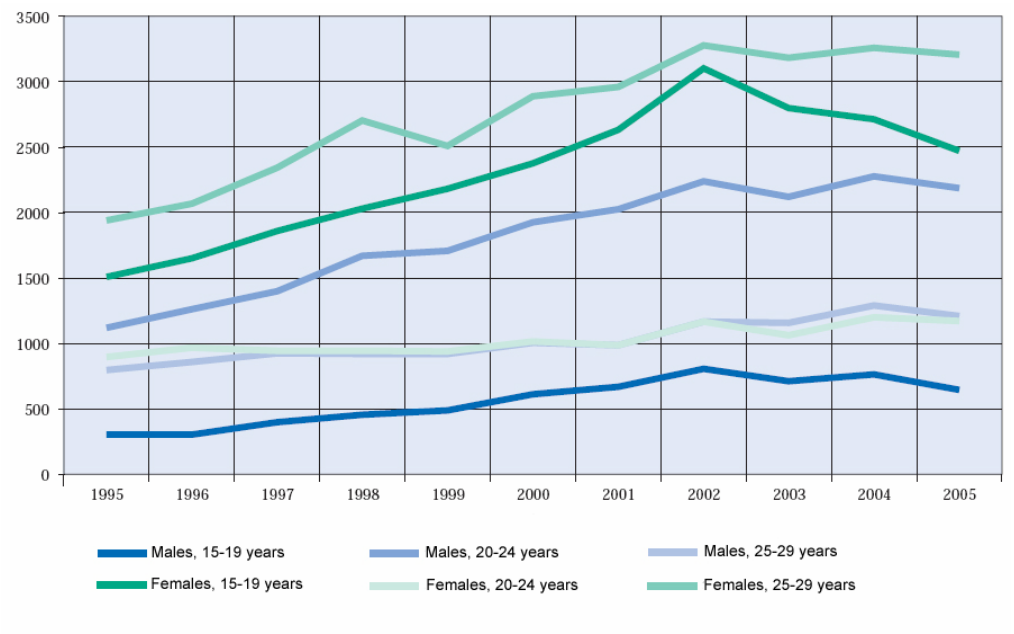


Figure 8. Chlamydia in the age groups of young adults 1995-2005

Table 4. Gonorrhoea infections acquired domestically and abroad 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Domestically acquired infections	185	83	94	100	108	129	113	100	89	133	126
Infections acquired abroad	130	88	75	98	85	105	80	82	59	72	70
Russia	70	50	42	49	42	48	34	28	9	7	22
Thailand	9	9	7	16	19	18	17	31	27	38	28
Estonia	26	9	7	9	8	7	3	5	2	6	1
others	25	20	19	24	16	32	26	18	21	21	19
Place of acquisition unknown	63	55	49	71	62	50	54	53	41	47	44
Total	**378**	**226**	**218**	**269**	**255**	**284**	**247**	**235**	**189**	**252**	**240**

Table 5. Syphilis infections acquired domestically and abroad 1995-2005

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Domestically acquired infections	48	53	50	46	21	54	31	24	30	22	24
Infections acquired abroad	64	81	70	60	62	101	64	36	41	29	48
Russia	49	57	48	33	43	80	49	21	18	15	23
Estonia	5	11	5	5	3	3	2	1	6	1	6
Somalia	-	1	2	5	2	-	1	2	2	-	3
Thailand	1	-	1	4	-	1	1	-	1	2	1
others	9	12	14	13	14	17	11	12	14	11	15
Place of acquisition unknown	57	85	52	81	57	49	64	68	62	55	73
Total	**169**	**219**	**172**	**187**	**140**	**204**	**159**	**128**	**133**	**106**	**145**

6.4 HIV

6.4.1 Hiv is becoming more common in immigrants

In 2005, the proportion of sexually transmitted hiv cases (N=96;49.6%) remained at the same level as in 2004. However, the proportion of annually diagnosed new sexually transmitted cases among all hiv infections has increased considerably since the turn of the millennium (an increase of 134% from the year 1999). The proportion of immigrants is also higher than before (N=58; 41.7%).

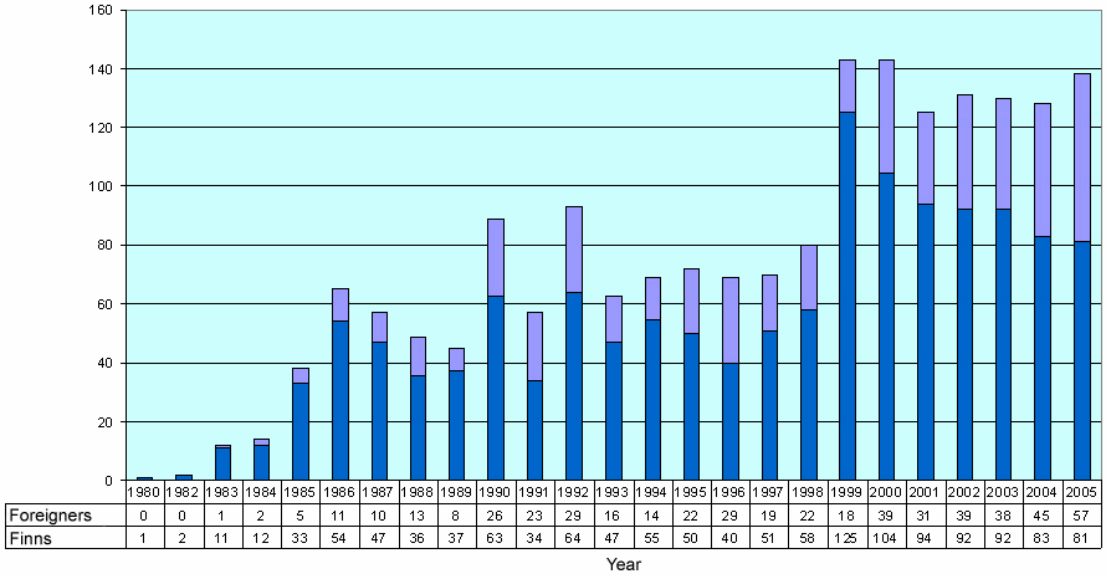
The number of hiv cases diagnosed in foreigners has grown steadily in recent years, and in 2005 they constituted more than 40 per cent of all infections.

Since the early years of the epidemic, the proportion of foreigners has grown annually by 30 per cent on average. Most of them have arrived in Finland from regions endemic for hiv, and their infection is sexually transmitted. Therefore, hiv cases in immigrants increase the proportion of infections transmitted in heterosexual contact. The number of sexually transmitted infections has also increased in the Finnish population, and this is associated with unprotected sexual contacts at home as well as sex tourism.

Immigrants do not have much effect on the epidemic among the native population, but within their own communities the relatively high prevalence of hiv results in a worse hiv situation compared with native Finns.

In Finland, prevention of hiv in immigrants is mainly based on voluntary health inspections performed

at the reception centres for asylum seekers and refugees. This is not sufficient to efficiently prevent hiv infections among immigrants. In Finland there is clearly a need to reinforce the prevention of hiv transmission between immigrants. (Figure 9.)



	1980	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Foreigners	0	0	1	2	5	11	10	13	8	26	23	29	16	14	22	29	19	22	18	39	31	39	38	45	57
Finns	1	2	11	12	33	54	47	36	37	63	34	64	47	55	50	40	51	58	125	104	94	92	92	83	81

Figure 9. Hiv cases detected among Finns and immigrants 1980-2005

6.4.2 Good antiretroviral resistance situation

For a few years now, Finland has monitored the prevalence and incidence of resistance developed by the hiv virus to antiretroviral medicines used in the treatment of hiv infections. Surveillance of resistance that develops during the course of medical treatment has been possible for the longest time, since 1999, as the test is used in the planning of hiv treatment. Since 2003, resistance information has also been available from the majority of new cases through the FINNSPREAD project, financed by the EU and the National Public Health Institute.

In all groups of anti-hiv medicines, resistance developing during

treatment has decreased. Prevalence of significant resistance to nucleoside (RTI), non-nucleoside (NRTI) and protease (PI) drugs in cases selected by clinical criteria has fallen below 20 per cent for all these drugs (for example the drugs in RTI class; figure 2). Resistance occurs most commonly to 3TC in the RTI class, but resistance to this has also fallen below 20 per cent in recent years.

In new cases, resistance to antiviral agents is still rare. In 2003–2005, resistance mutations were detected in only 2.3 per cent of the cases tested. However, in many European countries the situation is not quite as good, which is why Finland should continue the surveillance. (Figure 10.)

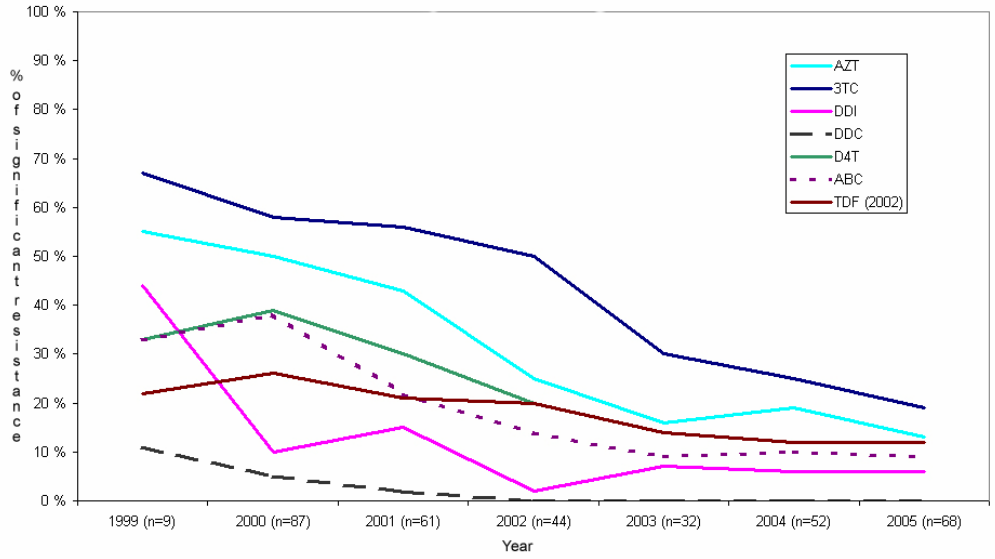


Figure 10. Resistance to nucleoside inhibitor class ARV-drugs (among cases on treatment sampled on the basis of a clinical indication)

7 MYCOBACTERIAL INFECTIONS

7.1 Tuberculosis – *Mycobacterium tuberculosis*

Since 1995, the registered tuberculosis cases include all cases confirmed by culture, as notified by the laboratories, and cases notified by a physician only, if the diagnosis is based on histology or a case of pulmonary tuberculosis is confirmed by positive sputum staining for tuberculosis bacilli.

In 2005, the number of tuberculosis cases (356) increased by eight per cent from 2004 (331). In 2005, the number of tuberculosis cases confirmed by culture, 314, increased by 10 per cent from the previous year's figure, 286. The incidence of tuberculosis was 6.8 cases per 100,000 population. The long-term decreasing trend was interrupted most recently by a similar rise in 1997–1998. Based on physicians' notifications, 20 (6%) cases had previous history of tuberculosis diagnosed after 1950, which is when anti-tuberculosis drugs became available.

There were 258 cases of pulmonary tuberculosis (incidence 4.9/100,000 population) and 98 cases of other forms of tuberculosis. Physicians reported positive sputum staining for tuberculosis bacilli in 132 cases of pulmonary tuberculosis (51%). In 10 per cent of cases no staining was performed or the data were missing.

Five of the notified cases (1%) were diagnosed in under 15-year-olds, 30 (8%) in 15–29-year-olds, 37 (10%) in 30–44-year-olds, 74 (21%) in 45–59-olds, 92 (26%) in

60–74-year-olds and 118 (33%) in 75-year-olds or older.

In 2005, there were 52 cases (15% of all cases) who were born abroad or were citizens of other countries. Four (8%) of them were under 15 years of age, and 45 (87%) were 15–50 years old. Twenty-nine cases (56 %) were pulmonary tuberculosis and twenty-three (44 %) represented other forms of tuberculosis.

The susceptibility of *Mycobacterium tuberculosis* strains is still good. In 2005, two (1%) multiresistant (resistant at least to isoniazid and rifampicin) *M. tuberculosis* strains were detected. (Table 6.)

Table 6. Incidence of tuberculosis in Finland 1995-2005

Year	Pulmonary tuberculosis				Other tuberculosis		All cases			
	Cases	Incidence / 100,000	Positive sputum	Incidence of positive sputum stains / 100,000	Cases	Incidence / 100,000	Cases	Incidence / 100,000	Culture-confirmed cases	Proportion of culture-confirmed cases (%)
1995	438	8,5	244	4,7	224	4,4	662	12,9	472	71,3
1996	432	8,4	241	4,7	213	4,1	645	12,5	510	79,1
1997	363	7,1	188	3,7	212	4,1	575	11,2	435	75,7
1998	396	7,7	201	3,9	233	4,5	629	12,2	491	78,1
1999	382	7,5	180	3,5	184	3,6	566	11,1	487	86,0
2000	370	7,2	228	4,4	167	3,2	537	10,4	451	84,0
2001	316	6,1	159	3,1	178	3,4	494	9,5	411	83,2
2002	297	5,7	137	2,6	177	3,4	474	9,1	392	82,7
2003	292	5,6	148	2,8	123	2,4	415	8,0	347	83,6
2004	230	4,4	127	2,4	101	1,9	331	6,3	286	86,4
2005	260	5,0	132	2,5	96	1,8	356	6,8	314	88,2

7.2 Molecular epidemiology of tuberculosis

In 2005, the genotyping of all new *M. tuberculosis* strains was not continued. Instead, targeted typing was performed when tracing the source of infection.

In autumn 2005, tuberculosis was diagnosed in Helsinki in three young Finnish-born patients with no identified contacts to other tuberculosis cases. Based on typing data, two of the cases belonged to the same tuberculosis cluster. The third patient's bacterial strain belonged to the so-called "jazz cluster", which is common in Helsinki. This cluster has spread mainly among the homeless and alcoholics. No epidemiological link could be found between the boy from Helsinki and other cases with the same strain.

Another *M. tuberculosis* strain that was closely related to the jazz cluster spread in Keuruu, Central Finland, in 2005. Both cases with the multiresistant (MDR) *M. tuberculosis* strain came from Russia, and their bacterial strains belonged to the rapidly spreading "Beijing group", common in Russia.

7.3 Mycobacterium bovis BCG

M. bovis BCG is a bacterial strain attenuated for vaccination purposes from the *M. bovis* bacterial species belonging to the *M. tuberculosis* complex. The attenuated strain does not cause tuberculosis. It is used in BCG vaccinations for newborn babies to prevent severe forms of tuberculosis in infants.

The number of laboratory notifications to the National Infectious Diseases Register of *M. bovis* BCG in children under 15 years of age,

based on positive culture, was 1–5 cases per year in 1995–2002, but rose to 30 in 2003 and has remained high compared with the earlier situation (14 cases in 2004 and 23 cases in 2005). The Department of Vaccines monitors clinical adverse effects of vaccinations, which together with the reporting of *M. bovis* BCG findings as notified by the laboratories, forms an exceptionally efficient system of monitoring the adverse effects of this vaccine. As tuberculosis has become rare in Finland and adverse effects associated with BCG vaccinations have increased in recent years, a decision has been made to target BCG vaccinations to children with an increased risk of tuberculosis, instead of vaccinating all newborn babies.

8 ANTIMICROBIAL RESISTANCE

8.1 MRSA

8.1.1 The MRSA situation is no longer deteriorating

In 2005, the situation of methicillin-resistant *Staphylococcus aureus* (MRSA) was no longer getting worse. This was also reflected in the situation of invasive infections. Less than 1,400 cases of MRSA were notified to the National Infectious Diseases Register (1,460 cases in 2004). MRSA findings in blood totalled 27 (32 cases in 2004), and there were no findings in cerebrospinal fluid.

As earlier, the hospital districts of Helsinki and Uusimaa, Pirkanmaa and Pohjois-Pohjanmaa reported the highest number of cases. However, the incidence per 100,000 population was highest in the hospital districts of Etelä-Karjala, Satakunta and Pohjois-Savo. As earlier, the majority of the findings were made in over-70-year-olds. Even though MRSA was rare in children (<6% of cases), the number of infections increased in children under 12 months of age. (Figure 11.)

The National Public Health Institute's Hospital Bacteria Laboratory confirms and types all MRSA strains in Finland. In 2005, more than 1,700 strains were examined, which is about the same as in 2004. Approximately forty per cent of confirmed MRSA infections were caused by two multiresistant epidemic strains (FIN-16 and FIN-21 epidemic strains). Other epidemic strains observed in previous years (FIN-4, FIN-7 and FIN-10 clones) were also common in many hospital districts. This was the first time that the FIN-11 strain was among the ten most common MRSA strains. Its

characteristics are consistent with those of the internationally occurring Panton-Valentine leukocidin producing outpatient MRSA strains. Infections caused by this strain have also become more common in other Nordic countries. (Table 7.)

Table 7. MRSA findings and their proportion of *S. aureus* blood culture findings 1995-2005

Year	All MRSA-findings	*S. aureus* blood culture findings	MRSA blood culture findings and the meticillin resistance of *S. aureus* (%)
1995	89	627	2 (0,3)
1996	108	667	-
1997	120	747	4 (0,5)
1998	189	717	5 (0,7)
1999	211	812	8 (1,0)
2000	261	849	4 (0,5)
2001	340	887	4 (0,5)
2002	599	988	10 (0,9)
2003	851	978	7 (0,7)
2004	1460	1057	32 (2,9)
2005	1368	1013	27 (2,7)
1995-2005	**5596**	**9342**	**103 (1,1)**

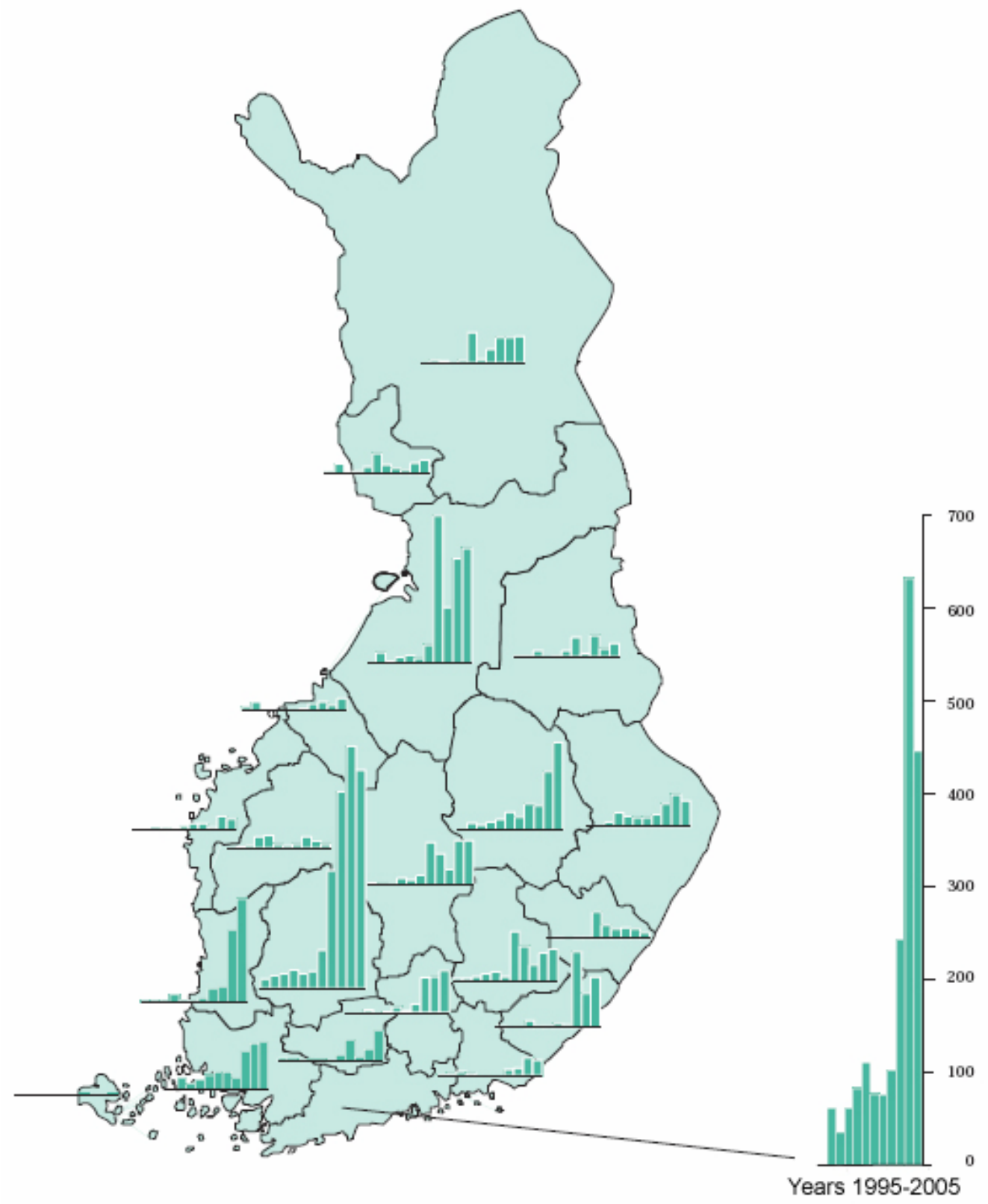


Figure 11. MRSA cases by hospital district 1995-2005

8.2 VRE

In 2005, the findings of vancomycin-resistant enterococci (VRE) notified to the National Infectious Diseases Register increased from the earlier less than twenty to more than 70. The majority of cases occurred in the Pohjois-Pohjanmaa hospital district. The frequency of findings was highest early in the year, and most of the patients were at least 70 years of age. In other hospital districts (n=4) the number of findings ranged from one to three. No VRE findings were made in blood or cerebrospinal fluid.

In 2005, the National Public Health Institute's Hospital Bacteria Laboratory tested a total of 71 new VRE strains from 70 persons by bacterial typing. In Pohjois-Pohjanmaa, infections caused by epidemic VRE strains (VRE II and VRE IV) of two different *van*B type *Enterococcus faecium* strains and by one *van*B type *E. faecalis* strain (VRE V) were diagnosed in a total of 60 patients, and in Pohjois-Karjala there were two *van*B type *E. faecium* findings (VRE VI strain). The other nine VRE strains observed in different parts of Finland (in 8 patients altogether) were non-identical with each other. Six different epidemic VRE strains (VRE I–VI) and a number of sporadic VRE strains have been identified in Finland by bacterial typing in 1996–2005.

9 PNEUMOCOCCUS

The incidence of invasive pneumococcal disease has been increasing slightly in recent years. In 2005, there were 735 notified cases (14 cases per 100,000 population).

In 2005, the National Public Health Institute's Antimicrobial Research Laboratory analysed the antimicrobial susceptibility of 731 pneumococcal strains cultured from blood or cerebrospinal fluid. Compared with the year 2004, the proportion of strains with reduced susceptibility to penicillin (MIC ≥ 0.125 µg/ml) has remained the same (9.6%). The proportion of resistant strains (MIC ≥ 2 µg/ml) was 2.3 per cent, and 7.3 per cent of the strains had reduced susceptibility (I, intermediate). The proportion of macrolide resistant strains also remained the same; 20.5 per cent of invasive pneumococcal strains were resistant to macrolides. In 2005, the proportion of multiresistant strains was 4.4 per cent, indicating a slight increase from 2004.

10 OTHER INFECTIONS

10.1 Puumala virus

More than 2,500 cases of Puumala virus infection were reported, which is the second largest number in the history of the National Infectious Diseases Register. The number of cases varies, depending on the size of the bank vole population, which is the virus reservoir. The variation has a three-year cycle so that two winters with a large number of cases are followed by a quieter November–December. The last quiet year was 2003 with 215 reported cases of Puumala virus in November-December, while during the same period in 2004 there were 626 cases and 720 cases in 2005. Last year the seasonal variation was also typical for Puumala virus: the frequency was highest in November–December, but there were also more than 300 cases in August. The frequency was lowest in March–May.

Age and gender distribution was the same as before. Of the cases, 61 per cent were men and most of them of working age. In compliance with previous years, the incidence was highest in the hospital districts of Etelä-Savo (270/100,000) and Itä-Savo (174/100,000). (Figure 12.)

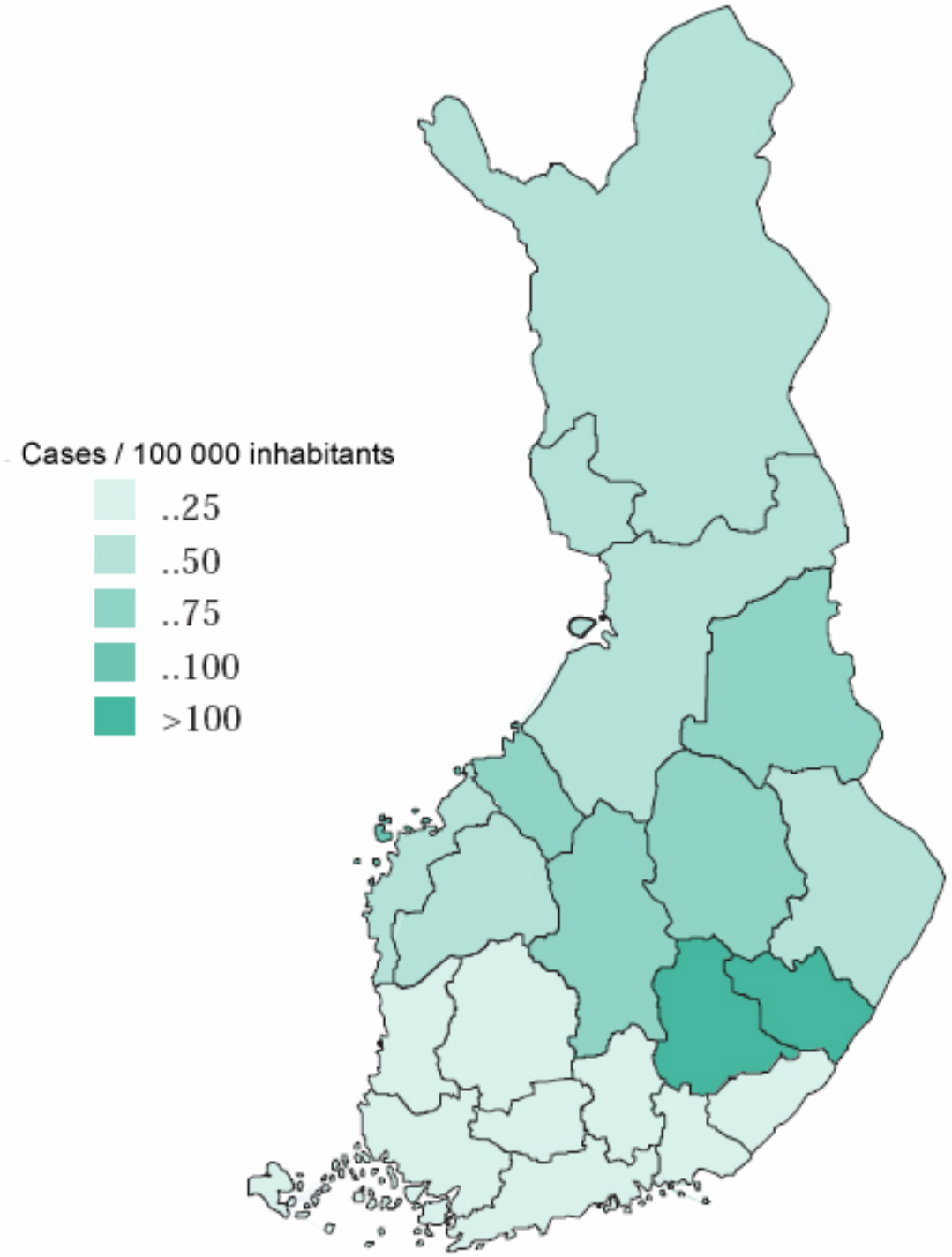


Figure 12. Average incidence of Puumala virus cases by hospital district 1995-2005

10.2 Tularemia (*Francisella tularensis*)

The National Infectious Diseases Register received 62 notifications of microbiologically confirmed cases of *Francisella tularensis* (incidence 1.2/100,000 population). The number is clearly below the long-time average in Finland, which is about 100 cases per year. More than half of the cases were diagnosed in the hospital districts of Keski-Suomi, Etelä-Pohjanmaa and Pohjois-Pohjanmaa in July–October. Tularemia is endemic in these regions.

10.3 Pogosta disease

The number of notified Pogosta disease cases (31 cases, incidence 0.6/100,000 population) was the lowest since 1999. The majority of cases were reported in August–September in the eastern and central parts of Finland and in Pohjanmaa. Pogosta disease, caused by the Sindbis virus, manifests in extensive outbreaks with seven-year intervals. The last year with an outbreak was 2002, with nearly 600 reported cases.

10.4 Lyme disease

The number of borreliosis cases was higher than ever before (1,236). Again, the incidence was highest in Åland, which accounted for some 40 per cent of all borrelia cases in Finland (1,931/100,000 population). Borrelia occurs most commonly in autumn, in August–November. Borrelia infections were most common in middle-aged and older age groups; only one quarter of cases was under 45 years of age. (Figure 13.)

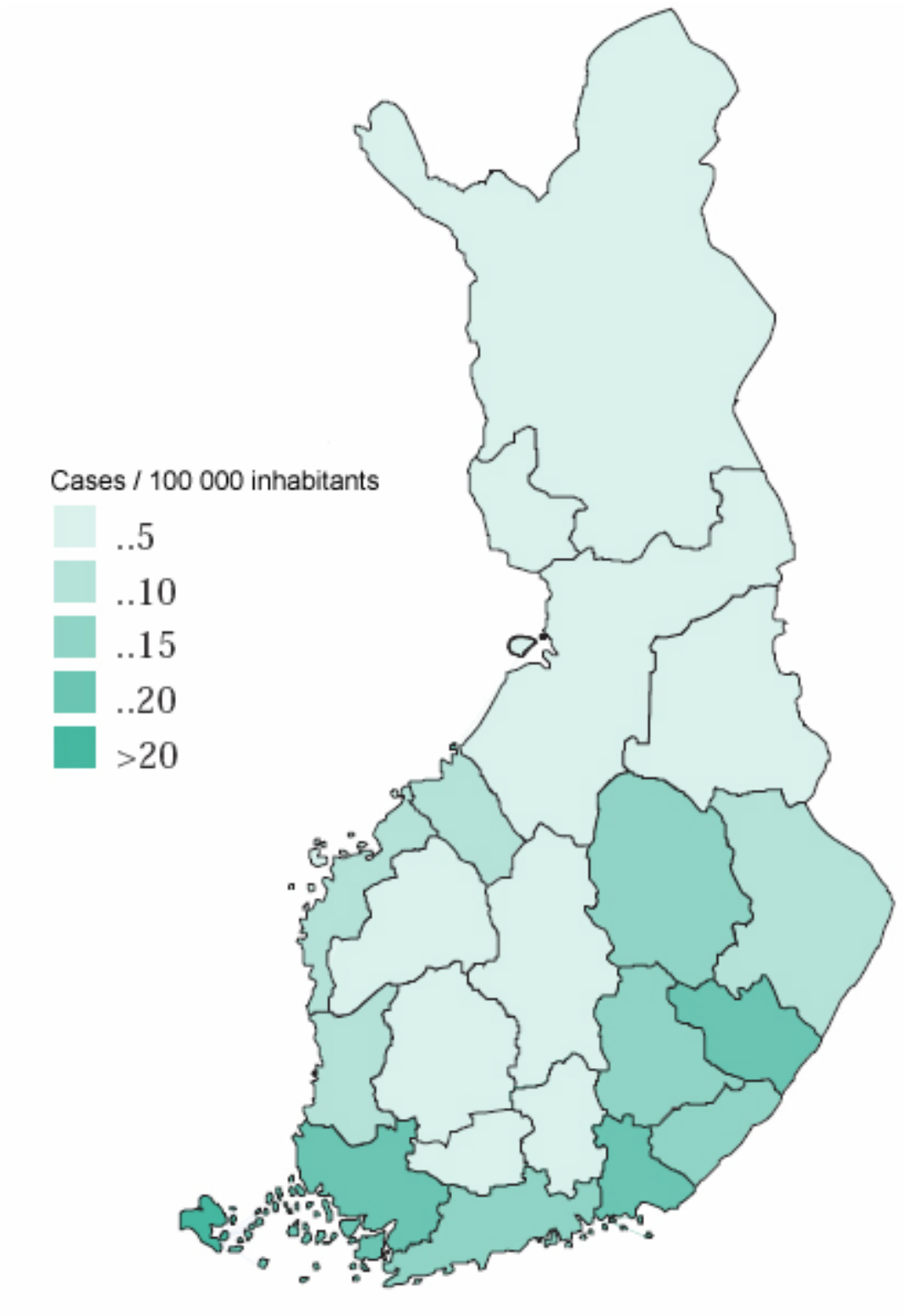


Figure 13. The average incidence of borreliosis cases by hospital district 1995-2005

10.5 Malaria

Compared with previous years, the number of malaria cases, countries of acquisition and risk groups have remained approximately the same.

In 2005, 25 patients were diagnosed with malaria in Finland. There were 19 *Plasmodium falciparum* infections, three *P. vivax* infections and two *P. ovale* infections. In one case the species was unidentifiable.

The majority of infections (22 patients, 88%), including all falciparum and ovale malaria cases, were acquired in Africa. One of the *P. vivax* infections was from India, one from Thailand and one from Guatemala. (Table 8.)

Table 8. Malaria cases detected in Finland in 2005 by country of acquisition

Continent	Country	cases
Asia	India	1
	Myanmar or Thailand	1
	total	**2**
Africa	Nigeria	4
	Cameroon	3
	Mozambique	3
	Ghana	2
	Zambia	2
	Gabon	1
	Gambia	1
	Kenya	1
	Liberia	1
	Sierra Leone	1
	Tanzania	1
	total	**20**
Central America	Guatemala	1
	total	**1**
unknown		2
	Total	**25**

Thirteen cases were Finns and twelve were foreigners. Ten were native Finns on a short (less than 6 months) visit to a malaria region, and one was a Finn living in a malaria region. Seven cases were immigrants from malaria regions who had visited their former home. Two were immigrants who became ill immediately after arriving in Finland. Five patients were visitors in Finland.

The majority of cases (22) had taken no malaria prophylaxis or had taken it irregularly. Three persons developed malaria despite regular prophylaxis. One had a *P. ovale* infection, which may become activated despite proper prophylaxis several months or even years after transmission. This is caused by the hypnozoite forms that lie dormant in the liver. Two cases had falciparum malaria clinically resistant to drugs. Both infections had been acquired in Africa. One of these two cases had used a combination of chloroquine and proguanil as prophylaxis, and the other had used a combination of pyrimethamine and dapsone.

Information on malaria prevention is available (in Finnish) in Matkailijan terveysopas at www.ktl.fi / Julkaisut / Matkailijan terveysopas.

10.6 TBE

The number of tick-borne encephalitis cases has grown steadily since the 1990s. The record year was 2000 (41 cases). Last year, only 16 cases of tick-borne encephalitis were notified to the National Infectious Diseases Register, which equals the figure of 2003 and is lower than in 2004. Again, half of last year's cases were reported in Åland.

10.7 Meningococcus

The number of meningococcal infections detected in blood or cerebrospinal fluid totalled 39, which is approximately the same as in recent years. The serogroup distribution was the same as before. The majority of cases were caused by group B meningococcus. There were three group Y strains and one group C strain. Eight patients were small children of 0–4 years of age, and 12 were 15–19-year-old adolescents. No temporal or local clusters were detected. (Table 9.)

10.8 MPR diseases

Finland is the first country in the world without a single endemic case of rubella, measles or mumps in ten years. Each year some cases are diagnosed that were brought from abroad by travellers. All MPR diseases are still common in many European countries.

Six cases of mumps were reported in Finland last year. Infections had been acquired in China, Spain, Romania and possibly Japan. No rubella cases were reported. One unvaccinated 39-year-old Finnish woman contracted measles, trans-

mission suspected to have occurred in Italy.

10.9 *Haemophilus influenzae*

There were 43 notified invasive infections caused by *Hemophilus influenzae*. In four cases, *Hemophilus influenzae* type B (Hib) caused the disease. The only Hib case in the vaccinated age cohorts was of foreign birth, an eight-month-old baby visiting Finland. No data were available on the child's vaccination history. Other patients with invasive Hib infections were 39–48 years old. In their childhood this vaccination was not yet included in the vaccination programme.

Table 9. Meningococcal infections by serogroup 1995-2005

Year	Group A	Group B	Group C	Group Y	Group W135	Unknown	Total
1995	-	50	22	-	-	6	78
1996	-	59	15	3	-	2	79
1997	-	36	5	3	-	2	46
1998	-	44	7	2	-	1	54
1999	-	35	9	8	1	4	57
2000	-	30	11	2	3	2	48
2001	-	34	9	4	1	3	51
2002	-	36	6	4	1	2	49
2003	-	28	5	7	-	2	42
2004	-	32	5	4	2	4	47
2005	-	35	1	3	-	-	39

APPENDIX 1. BLOOD CULTURE FINDINGS 1995-2005

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Staphylococcus, other than aureus	54	56	59	64	86	76	100	117	85	155	134
Streptococcus agalactiae	45	50	42	48	42	38	41	46	37	45	73
Escherichia coli	52	38	40	48	39	43	39	40	39	37	41
Staphylococcus aureus	27	22	22	33	29	17	17	24	21	32	32
Streptococcus pneumoniae	21	11	14	17	16	28	15	12	23	28	26
Enterococci	15	15	9	12	8	8	7	13	13	13	17
Streptococcus viridans and milleri groups	11	10	9	6	13	7	11	9	12	15	12
Klebsiella species	5	12	8	8	10	9	8	7	8	9	9
Enterobacter species	9	5	7	7	10	6	6	6	6	5	3
Neisseria meningitidis	3	6	2	5	4	8	3	2	2	5	3
Other bacteria	21	15	13	31	27	26	18	25	22	26	13
Bakteria, total	263	240	225	279	284	266	265	301	268	370	363
Fungi	6	4	1	3	16	12	11	18	4	3	5
Total number of cases	269	244	226	282	300	278	276	319	272	373	368

Blood culture findings 1995-2005, infants (under 1 year of age)

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Streptococcus pneumoniae	71	87	74	60	61	72	76	87	89	88	101
Staphylococcus, other than aureus	61	36	43	38	55	65	44	57	48	41	59
Staphylococcus aureus	44	35	54	48	57	42	35	58	47	58	41
Streptococcus viridans and milleri groups	23	25	27	26	20	20	23	24	12	18	27
Escherichia coli	11	11	19	13	14	20	5	13	13	15	10
Klebsiella species	4	1	7	3	4	2	2	6	4	5	10
Pseudomonas species	5	6	13	14	4	9	12	5	8	6	7
Neisseria meningitidis	3	11	8	9	12	9	9	8	6	2	7
Bacillus species	3	5	4	1	4	9	2	5	6	2	7
Enterococci	6	4	3	2	4	2	4	8	5	6	6
Other bacteria	30	45	37	43	55	46	36	43	46	32	44
Bacteria, total	261	266	289	257	290	296	248	314	284	273	319
Fungi	9	3	6	3	7	5	1	3	3	1	1
Total number of cases	270	269	295	260	297	301	249	317	287	274	320

Blood culture findings 1995-2005, children (1-14 years)

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Escherichia coli	407	423	498	495	547	532	613	580	645	707	780
Staphylococcus aureus	279	288	348	340	389	394	437	457	445	486	457
Staphylococcus, other than aureus	265	311	293	342	359	413	421	461	421	436	411
Streptococcus pneumoniae	221	251	293	283	298	308	342	312	381	387	375
Streptococcus, beta-haemolytic	119	123	166	177	205	206	202	249	225	259	271
Streptococcus viridans and milleri groups	116	137	140	149	168	171	166	166	174	198	201
Klebsiella species	92	93	113	106	114	115	114	134	121	159	184
Enterococci	81	105	121	112	117	111	164	165	145	136	178
Pseudomonas species	101	90	95	73	76	92	89	90	95	75	104
Bacteroides species	64	55	71	68	77	71	70	66	59	73	85
Other bacteria	379	367	367	417	408	430	466	360	401	421	469
Bacteria total	2124	2243	2505	2562	2758	2843	3084	3040	3112	3337	3515
Fungi	32	49	54	62	58	56	71	54	80	71	66
Total number of cases	2156	2292	2559	2624	2816	2899	3155	3094	3192	3408	3581

Blood culture findings 1995-2005, working-age population (15-64 years)

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Escherichia coli	857	951	998	967	1012	1033	1178	1213	1314	1466	1623
Staphylococcus aureus	277	322	322	296	337	397	398	449	466	483	483
Staphylococcus, other than aureus	253	265	256	231	294	372	388	379	370	399	414
Klebsiella species	143	155	161	177	167	201	241	230	252	342	339
Enterococci	145	145	140	168	169	210	224	215	241	305	273
Streptococcus, beta-haemolytic	91	136	159	150	170	162	194	195	213	241	258
Streptrococcus pneumoniae	165	175	196	185	178	189	214	184	220	240	229
Streptococcus viridans and milleri groups	90	86	111	106	110	124	128	121	155	160	167
Pseudomonas species	144	134	120	104	134	132	143	157	160	151	164
Bacteroides species	73	77	99	85	107	103	109	99	122	128	139
Other bacteria	297	357	372	392	379	442	486	459	472	538	602
Bacteria total	2535	2803	2934	2861	3057	3365	3703	3701	3985	4453	4691
Fungi	46	36	36	43	51	68	71	71	113	77	68
Total number of cases	2581	2839	2970	2904	3108	3433	3774	3772	4098	4530	4759

Blood culture findings 1995-2005, aged population (65 years and more)

APPENDIX 2. CEREBROSPINAL CULTURE FINDINGS 1995-2005

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Streptococcus agalactiae	2	8	2	9	4	4	2	5	1	10	7
Staphylococcus, other than aureus	2	-	3	4	7	5	3	10	4	5	4
Streptococcus pneumoniae	7	2	2	1	6	1	1	3	6	8	3
Staphylococcus aureus	1	1	1	1	-	1	1	-	3	2	1
Haemophilus species	1	1	-	1	-	1	2	-	-	-	1
Other bacteria	4	5	10	8	5	6	8	5	7	12	-
Bacteria, total	17	17	18	24	22	18	17	23	21	37	16
Fungi	-	-	-	1	-	-	-	-	-	-	-
Total number of cases	17	17	18	25	22	18	17	23	21	37	16

Cerebrospinal fluid culture findings 1995-2005, infants (under 1 year of age)

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Staphylococcus, other than aureus	-	8	3	4	7	7	2	10	3	6	5
Neisseria meningitidis	8	6	9	14	9	6	5	7	4	4	5
Streptococcus pneumoniae	5	6	2	6	6	2	2	1	7	2	1
Enterococcus species	-	1	2	-	1	1	-	1	-	2	1
Acinetobacter species	-	-	-	-	-	-	-	1	-	1	1
Other bacteria	6	4	7	6	6	8	15	9	8	4	6
Bacteria, total	19	25	23	30	29	24	24	29	22	19	19
Fungi	-	-	-	-	-	-	-	-	-	1	-
Total number of cases	19	25	23	30	29	24	24	29	22	20	19

Cerebrospinal fluid culture findings 1995-2005, children (1-14 years)

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Staphylococcus, other than aureus	5	10	8	21	29	29	38	46	32	46	50
Streptococcus pneumoniae	16	19	21	23	18	16	24	11	21	21	15
Neisseria meningitidis	34	37	21	18	18	13	12	19	15	11	15
Staphylococcus aureus	-	10	5	10	12	11	7	6	10	17	10
Escherichia coli	1	1	2	1	4	2	-	3	-	-	7
Other bacteria	12	18	16	35	26	35	32	44	31	38	43
Bacteria total	68	95	73	108	107	106	113	129	109	133	140
Fungi	1	-	-	2	4	3	2	2	1	6	2
Total number of cases	**69**	**95**	**73**	**110**	**111**	**109**	**115**	**131**	**110**	**139**	**142**

Cerebrospinal fluid culture findings 1995-2005, working-age population (15-64 years)

Microbe / microbial group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Staphylococcuss, other than aureus	2	5	5	10	7	5	15	13	11	13	17
Streptococcus pneumoniae	6	6	4	5	4	6	4	4	5	4	8
Staphylococcus aureus	1	3	4	4	3	2	4	2	7	7	5
Listeria monocytogenes	3	2	4	4	1	2	3	2	4	2	4
Mycobacterium species	2	1	1	1	-	2	1	1	4	1	4
Other bacteria	3	9	15	6	5	8	17	21	15	11	9
Bacteria total	17	26	33	30	20	25	44	43	46	38	47
Fungi	-	2	-	-	-	-	-	2	-	1	1
Total number of cases	**17**	**28**	**33**	**30**	**20**	**25**	**44**	**45**	**46**	**39**	**48**

Cerebrospinal fluid culture findings 1995-2005, aged population (65 years and more)