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Measles outbreak in Gibraltar, August–October 2008 – a preliminary report

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To date, 276 clinical diagnosed cases of measles have been notified in Gibraltar. The outbreak, which has been ongoing since August 2008 and affected almost 1% of the local population, unmasked errors in vaccination uptake assumptions and highlighted the need for improved data recording and research on disease transmission rates in small crowded populations.

Introduction

Gibraltar is a British Overseas Territory on the Mediterranean Sea, famous throughout the world for its history, landscape and culture. Despite its larger-than-life image, it is physically quite small, a peninsula with 4 km2 of habitable area, home to around 28,000 residents, which makes it densely populated, with most people living in multi-storey apartments. The culture of Gibraltar is also very community-oriented and thus free interaction of the population on a daily basis is the norm. These factors can augment the spread of some infectious diseases. However, Gibraltar is a generally affluent nation with health indicators on par with Western Europe and good standards of public hygiene.

During the three-month period between 1 August 2008 and 31 October 2008, the Gibraltar Public Health Department was notified of 276 clinically diagnosed cases of measles. At the time of writing this report, occasional cases were still coming in. Prior to this outbreak, no cases of measles had been notified in Gibraltar for at least ten years [1].

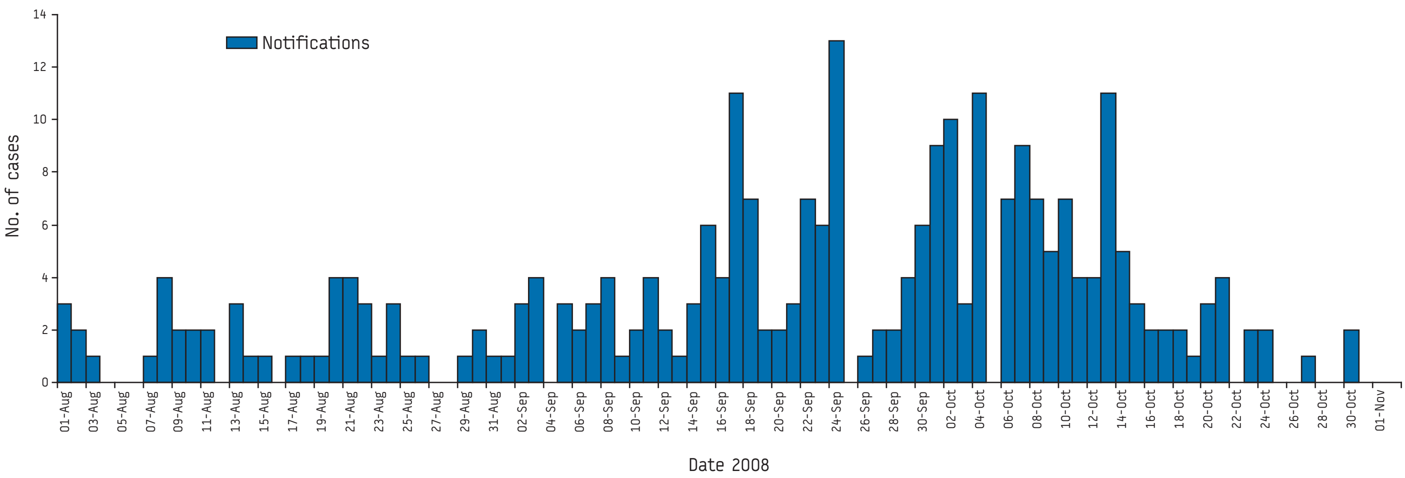
A rapid response process was put in place by the public health directorate during the second week of the outbreak. Every case clinically diagnosed as measles was notified immediately by telephone to the infection control team by family doctors, hospital doctors and emergency rooms. Infection control nurses visited every family within 24 hours, advised isolation precautions, identified contacts and obtained saliva samples. They found that in a number of families, more than one person was or had been affected although only one individual had been reported. The rapid response process thus also helped to maximise the ascertainment, but such intensity is difficult to sustain for a small nation and depends heavily on skilled staff working long hours of overtime.

Outbreak profile

After an initial period of about five weeks with 1-2 cases per day, the outbreak accelerated, averaging around 5-6 notifications per day (Figure). A pattern of mid-week peaks was observed, which is probably linked to reporting practices. It is hypothesised that community events like the Gibraltar fair (late August), opening of the school year (early September) and the National Day celebrations

Figure

Daily notifications of measles cases in Gibraltar (n=271*, as of 31 Oct 2008)



* The dates of notification of five of the 276 cases were not available at the time of writing.

(mid-September) encouraged extensive population mixing and fuelled the outbreak. More recent figures suggest that the outbreak may have peaked and notifications have now fallen to around 2-3 per week.

A significant majority of the cases (62%) occurred in the school-age group (five years to 19 years), with the youngest case four months-old and the oldest case 58 years-old. However, age-specific infection rates were highest in infants (Table). Only six cases occurred in people over the age of 40 years.

The typical case had high fever, followed by rash within 1-2 days, red eyes, sore throat and diarrhoea. Koplik's spots were observed in many patients. In general, the clinical course was mild with few complications. Hospital admissions were few, mostly for management of dehydration or superimposed infection, such as with *Mycoplasma pneumonia*. No cases of nosocomial transmission or cases in health staff were reported.

Confirmation

Diagnostic serology was performed for clinical reasons in just a few cases. However as part of the outbreak investigation, almost all cases submitted oral fluid samples for investigation by the Virus Reference Department in the United Kingdom (UK). For logistic reasons, the results are somewhat in arrears. At the time of writing, 152 results had been received, of which 130 were confirmed measles (86%). Of the rest, 10 had evidence of old immunity (IgG antibodies), five were undergoing further PCR analysis and seven had no anti-measles antibodies. Results from the entire survey will form a separate body of work.

All the viruses isolated were of the Enfield genotype D4 strain. Two of the sequences have been submitted to NCBI GenBank.

Immune status

All of the 268 clinically diagnosed measles cases for whom immunisation histories have been ascertained occurred in persons who were unimmunised or were partly immunised (Table).

The measles-mumps-rubella (MMR) vaccine immunisation programme was first introduced in Gibraltar in 1989, offering a single dose to all children at the age of 18 months. In 2002, the age was reduced to 15 months and a pre-school booster dose was added, although no catch-up was organised at the time. All public programme vaccinations are free of charge to all residents of Gibraltar. In addition, public health legislation permits giving free vaccination to non-residents when indicated in the public interest.

Childhood immunisations are generally well accepted in Gibraltar with uptakes of well over 90%. Despite the MMR scare in the early 2000s and the persistent media disquiet, it had been believed anecdotally that Gibraltar's MMR uptake was also in excess of 90%, but the scale of this outbreak and the lack of computer-based records have revealed a need to establish more precise and reliable recording systems.

A public MMR immunisation campaign was launched in the second week of the outbreak to reach all unimmunised children (i.e. under 18 years). The lower age limit was extended to include infants at the age of six months and older. Unfortunately, the campaign had to be suspended twice due to vaccine shortages caused by the contemporaneous MMR catch-up programme in the UK, but is now under way again. The initial phase of open access self-referrals has so far provided around 500 vaccinations, which would comprise about 50-60% of the target unimmunised population. A phase of proactive immunisation on a child-by-child basis has been commenced to reach the rest.

Discussion

With the successful use of vaccine over several decades and the virtual disappearance of endemic disease, elimination of measles is seen as a realistic goal for European nations [2]. Despite public efforts to maintain high levels of vaccination however, sporadic outbreaks have occurred, often a combination of disease importation [3] and existence of pockets of non-immune populations [4]. It is believed that both factors have contributed to the outbreak in Gibraltar.

It has occurred in the wake of a large measles outbreak caused by the same D4 strain in the neighbouring Spanish town of Algeciras and surrounding areas, that has been ongoing since early 2008 [5]. There are large and free movements of Gibraltar and Spanish populations every day for domestic reasons, employment and tourism. During May and June 2008, Spanish authorities notified Gibraltar of five separate cases who had local connections to Gibraltar (such as employment), but no evidence of local transmission was found when these were followed up. However,

Table

Measles notifications in Gibraltar showing vaccination status by age group (as of 31 Oct 2008)

Age groups	MMR status			Total (%)	Age Specific Infection Rates (per 100,000)
	Unvaccinated	Vaccinated with One dose	To be Ascertained		
Under 15 months	21	3	0	**24** (9%)	4888.0
15months -4 years	11	13	0	**24** (9%)	1629.3
5 years-9 years	23	9	1	**33** (11%)	2122.2
10 years-14 years	44	12	3	**59** (21%)	2685.5
15 years-19 years	49	30	2	**81** (29%)	4497.5
20 years-29 years	32	5	2	**39** (14%)	1103.6
30 years-39 years	9	1	0	**10** (4%)	252.5
Over 40 years	6	0	0	**6** (3%)	45.8
Total	**195**	**73**	**8**	**276**	**982.3**

histories of the Gibraltar index case(s) suggested that possible interaction with the Spanish population might have provided the source. No anecdotal or other evidence is available to suggest that the outbreak might have been imported to Gibraltar from other geographically or economically linked countries where measles outbreaks have been reported, such as the UK [6], Portugal [7] or Morocco [8]. It is theorised that Gibraltar's good herd immunity probably held the disease at bay for several months.

Numbers in this outbreak have been relatively large and its spread exceptionally fast when compared with accounts recently published about outbreaks elsewhere in Europe [9]. In addition, as levels of notification in any system are rarely 100%, the true outbreak size is potentially greater.

Reported total incidence rates per 100,000 population in the literature for measles outbreaks occurring in non-endemic countries vary widely, for example, 14.0 in Hesse (2005) [10], 39.0 in the Cote D'Azur (2003) [11] and 49.0 in Algeciras (2008) [5], but Gibraltar has experienced some twenty times this intensity. Whilst questions on the exact uptake of the Gibraltar immunisation programme remain, this can only account for a small part of the difference. It is contended that the real difference arose from the compact and densely urban nature of the Gibraltar community, enabling the transmission of highly communicable airborne diseases to vulnerable people with efficiency and speed. Popular folklore in Gibraltar maintains that "when one has it, then everyone gets it", but this is the first time that rapid transmission of an infectious disease to such a large proportion of the vulnerable population has been documented here. This phenomenon needs further research, as orthodox application of published estimates of attack rates for infectious diseases derived from pooled or mixed populations may be inappropriate in such island communities and result in serious underestimates of forecast impact by planners serving atypical populations.

The immunisation drive currently under way, together with existing vaccination coverage (and measles infection) should in time substantially eliminate measles susceptibility in the population of under 18 year-olds. However, as the vaccination programme was commenced in 1989, most persons over the age of 18 years will not have been immunised through vaccination. Estimates of herd immunity are difficult to compile as systematic surveillance and recording only commenced in 1998 and no public record is available of past outbreaks of measles or as to when the disease ceased to be common. If a general presumption is made (based on the low attack rates seen in the over 40 year-olds during this outbreak) that the majority of people over the age of 40 years will have been exposed to wild measles virus, this leaves a population aged between 18 and 40 who could be largely non-immune. A public health programme targeting this population needs to be considered if measles elimination is the ultimate objective. However, such a programme would be expensive (in perspective, this population outnumbers the entire child population, whose immunisation has been achieved gradually over an 18-year period), require political support and could meet with poor compliance without a preparatory education programme.

Conclusions

A report is presented of a sudden and large outbreak of measles that has rapidly affected nearly 1% of the residents of the Territory, aided by a relatively crowded population and the presence of an apparently large number of unimmunised vulnerable people. It unmasked errors in vaccination uptake assumptions and highlighted the need to improve data recording. The institution of a rapid response strategy, albeit very demanding for staff, helped to optimise case management and maximise ascertainment.

A sustained MMR vaccination promotion campaign has in a short time reached over half the target (unimmunised child) population and further efforts are under way to reach the remainder proactively. If elimination of measles is to be the absolute goal, attention needs to be paid to extending immunisation to the vulnerable age group of 18-40 year-olds, but such a programme is likely to be resource-intensive.

Although most of the outbreak appears to have been controlled successfully, vaccine shortages and scarcity of skilled staff are matters of concern to emergency planning. Fortunately, the relative mildness of the illness did not tax the secondary care resources as it might have. Further research is needed on disease transmission rates in atypical populations like crowded urbanised neighbourhoods and in island communities, if planners are to rely on such knowledge for their forecasts.

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Rapid communications

Emergence of fox rabies in north-eastern Italy

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Italy has been classified as rabies-free since 1997. In October 2008, two foxes have been diagnosed with rabies in the Province of Udine, north-east Italy. One case of human exposure caused by a bite from one of the foxes has occurred and was properly treated.

On 17 October 2008, the national reference centre for rabies at the Istituto Zooprofilattico Sperimentale delle Venezie of Legnaro in Padova, Italy, identified a rabid red fox (Vulpes vulpes) in the municipality of Resia (Province of Udine, Northeast of Italy) (Figure 1) [1]. The fox had bitten a 69-year-old man on the ankle on 10 October. The victim received first aid assistance and complete post-exposure treatment at the local health unit. The exposed person is currently under active health surveillance.

Laboratory analysis

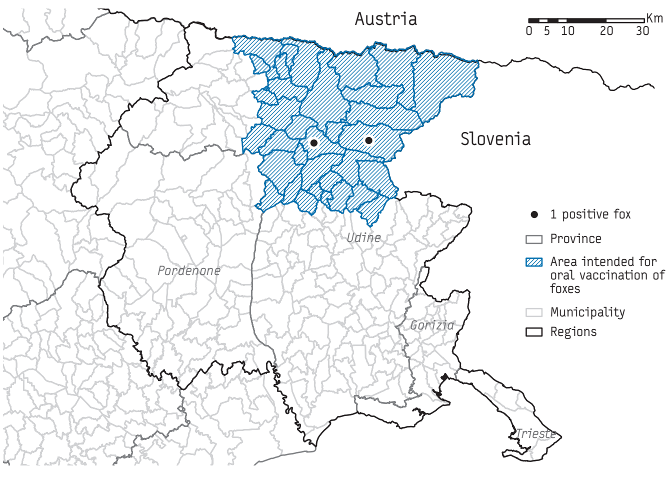
A brain sample from the fox initially tested negative in the fluorescent antibody test (FAT) for rabies virus (RABV). However, the virus was successfully isolated on murine neuroblastoma cell culture [2], and was confirmed as RABV by RT-PCR using specific primers. When the FAT was repeated on other brain specimens, the test was weakly positive.

The complete open reading frame (1,350 nt) of the gene encoding the nucleoprotein (N) was sequenced (GenBank Acc. Number FJ424484) and compared to the sequences available in public databases. Phylogenetic analysis was performed using the neighbour-joining method with 1,000 times bootstrapping, as implemented by the Mega 4 programme [3]. Phylogenetic analysis (Figure 2) identified the isolate as Lyssavirus genotype 1, "classical" rabies virus, according to the classification made by Kissi et al. [4], clustered in the Western European group [5]. As expected, it was closely related to RABV isolated from eastern neighbouring countries (Slovenia, Bosnia and Herzegovina and the former Federal Republic of Yugoslavia) and shared 99% homology with the complete N gene sequence of the strain 86111YOU and 100% homology with a 400 nt fragment of the N gene sequence of the strain 9494SLN, red fox isolates from Bosnia-Herzegovina and Slovenia, respectively.

According to the characteristics of the isolate it seems reasonable to believe that the emergence of sylvatic rabies in north-eastern Italy could be linked to infection in the bordering territories of Slovenia, although no cases are currently reported in the area.

Figure 1

Map of Friuli Venezia Giulia region, Italy, showing the two reported cases as well as the area where oral vaccination of foxes is being implemented



Rabies situation in Italy

The north-eastern territories of the Italian region of Friuli Venezia Giulia have been affected by rabies in the 1970s and 1980s, and more recently in the period from 1991 to 1995 [6]. The municipality of Resia was affected until 1992. At that time, the epidemic of sylvatic rabies was linked to the epidemiological situation of infection in Austria and the nearby territories of former Yugoslavia, now Slovenia. For this reason, the risk of rabies in the northern and eastern border regions of Italy has long been recognised. The rabies surveillance carried out in that region accounted for an annual number of 310, 210, 123, 94 and 85 foxes analysed from 2004 to October 2008, respectively. Vaccination campaigns using oral rabies vaccine baits have been conducted targeting the wild fox population in these areas in 1989 and between 1992 and 2004. The last case of rabies in Italy was diagnosed in a fox in the province of Trieste on the border with Slovenia in December 1995.

Italy has been classified as rabies-free since 1997. At present, Austria is rabies free, while in Slovenia, rabies cases in foxes are still being reported from the South Eastern regions bordering Croatia [7]. In this area oral vaccination campaigns are systematically conducted in the fox population since the mid-1990s in the framework of a national rabies eradication programme [8].

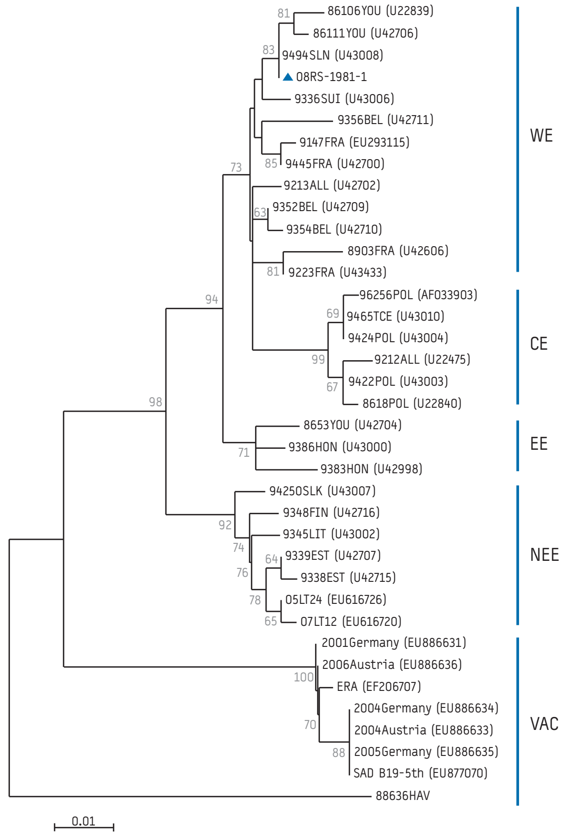
On 27 October 2008, a second fox was found dead and diagnosed with rabies in the municipality of Venzone (Province of Udine) (Figure 1), 12 km west to the one infected earlier the same month. No human exposure has been reported related to this second infected fox.

Measures taken

Following these outbreaks, the preventative measures implemented in the affected areas of Italy include compulsory rabies vaccination of dogs and domestic herbivores at risk of infection (i.e. cows, horses, sheep and goats kept outdoors), prohibition of hunting with dogs, enhanced surveillance in the wild animal population and implementation of oral vaccination of foxes (Figure 1). Furthermore, an informative campaign on the risk for the local population, as well as visitors and tourists, has been implemented and a protocol for post-exposure prophylaxis and recommendations for pre-exposure immunisation for individuals at high risk (such as hunters, forest workers, game wardens, veterinarians) have been sent to all healthcare facilities and medical associations in the affected area.

Figure 2

Phylogenetic tree (neighbour-joining method) of the nucleoprotein gene of a rabies virus isolated from a fox in Italy, October 2008



The sequence of the Italian isolate is identified with a blue triangle. Sequences of the other genes of this isolate can be found in GenBank.

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Rapid communications

West Nile virus infections in Hungary, August–September 2008

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Between 2003 and 2007, a yearly average of six cases of West Nile virus neuroinvasive infection were diagnosed in Hungary. In 2008, 14 cases have been confirmed by the end of October. In contrast with previous years the infection has now appeared also in the north-western part of the country which is endemic for tick-borne encephalitis.

Case descriptions

On 19 September the Hungarian reference laboratory for viral zoonoses reported the first two cases of West Nile virus (WNV) neuroinvasive infection in Hungary in 2008. As of 31 October a total of 14 confirmed cases were identified in accordance with the European Union case definitions [1]. In all 14 confirmed cases fever was accompanied by neurological symptoms. The clinical diagnosis for these cases included: serous meningitis (8 cases), encephalitis (4), meningoencephalitis (1), tick-borne encephalitis (1). All patients, except one, were hospitalised and all recovered.

Eight cases occurred in August, six in September. The earliest date of onset of symptoms of the first case was 14 August. The last patient was infected in the second half of September (date of onset 24 September). (Figure 1)

The age of cases ranged between 16 and 80 years (median 52 years). Ten cases were male and four female.

Four cases were residents of the Hajdú-Bihar county, two were living in Budapest, but supposedly exposed in the incubation period at the lake Balaton (Veszprém county) or in the Matra mountains (Heves county), two in Jász-Nagykun-Szolnok county and single cases were identified in Csongrád, Pest, Fejér, Győr-Moson-Sopron, Vas and Zala counties (Figure 2). The geographical distribution of cases shows than in contrast with previous years the infection has now appeared also in the north-western part of the country which is endemic for tick-borne encephalitis.

Epidemiological investigations

To date, detailed epidemiological investigations have been performed for 12 of the 14 cases, using a disease-specific case investigation form. None of these cases had travelled abroad during three weeks before the onset of disease. There was no history of blood transfusion or tissue/organ transplant. None of the cases was vaccinated against yellow fever or tick-borne encephalitis (as WNV belongs to the same genus of the family Flaviviridae, the presence of antibodies against one of these viruses may influence the course of illness caused by another virus of the same genus). No person with high fever or neurological symptoms has been identified among household or other contacts of the cases.

Seven of the investigated cases reported a history of mosquito bite.

Figure 1

Confirmed cases of West Nile virus infection, by week of onset of symptoms, Hungary, August-September 2008 (n=14)

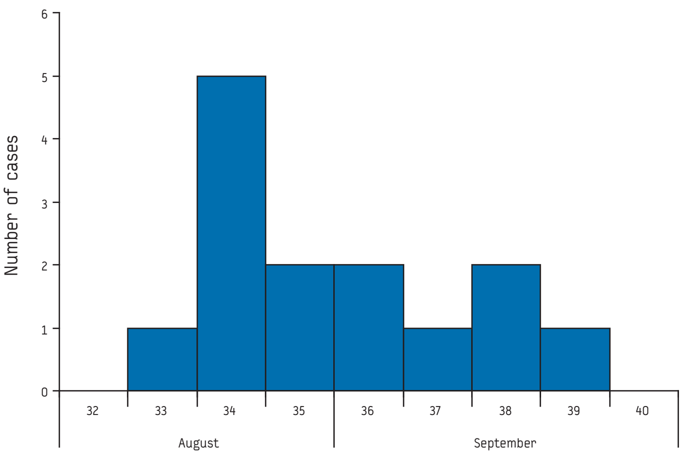
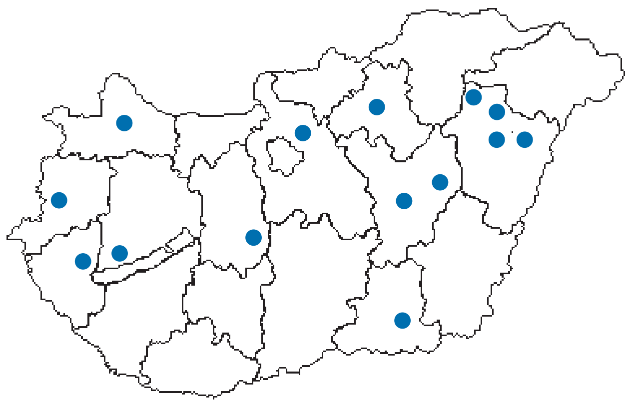


Figure 2

Geographical distribution of cases of West Nile virus infection, by place of potential exposure, Hungary, August – September 2008 (n = 14)



Laboratory investigations

Investigations at the national reference laboratory for viral zoonoses found IgM and IgG antibodies against WNV (titre = ≥640) in samples from 14 cases using indirect fluorescent antibody and haemagglutination inhibition tests. Titration of antibodies was performed in parallel tests for tick-borne encephalitis and WNV. These were thus considered confirmed cases of WNV infection.

Results of laboratory investigations of samples taken from another five patients with suspected WNV infection are still pending.

Response measures

The Department of Epidemiology of Communicable Diseases of the Hungarian National Centre for Epidemiology (Országos Epidemiológiai Központ) received the laboratory results of the first two cases of WNV infection on 22 September. It then immediately informed the Hungarian National Blood Transfusion Service (Országos Vérellátó Szolgálat) about these and the following confirmed cases, and found out that in the preceding six months none of the patients had given blood. Information about these human cases was also shared with the veterinary authorities at the Central Agricultural Office of the Ministry of Agriculture and Rural Development (Földművelésügyi és Vidékfejlesztési Minisztérium Mezőgazdasági Szakigazgatási Hivatalának Központja). The European Commission, European Centre for Disease Prevention and Control (ECDC), European Union (EU) Member States and the World Health Organization (WHO) were informed about the cases via the Early Warning and Response System (EWRS).

Every potential blood donor fills in a detailed questionnaire and is examined and interviewed by a physician. If no exclusion criteria are identified the National Blood Transfusion Centre accepts the blood donation. According to the regulations issued by the Hungarian Ministry of Health in 2005 [2] which incorporated the 2004 European Commission directive implementing the EU blood safety directive [3], patients diagnosed with WNV infection are excluded from blood, tissue and organ donation for 28 days after recovery. In addition, persons living in or visiting areas (in Hungary or abroad) where cases of WNV infection have occurred should be excluded from blood donation for the period of 28 days. This rule has been applied to travellers returning from abroad. However, it is difficult to execute it at present when cases occur in the country in densely populated areas (including the capital city) covering almost half of the territory. Therefore, in practice, to prevent the risk of WNV transmission the donor selection procedure has been strengthened regarding both the medical examination and the interview.

Furthermore, the National Centre for Epidemiology drafted a proposal of standard measures which should be applied following the confirmation of human cases. These include surveillance for animal cases (deaths in birds, neurological symptoms in horses) in the area where the exposure of human cases is believed to have taken place. According to this proposal, if the veterinary surveillance reveals animal cases mosquito control measures including larvicide and adulticide disinfestations have to be implemented. However, due to considerable costs, these measures should be applied only in epidemically justified situations, and in an area of up to 1 km in diameter around a case. The authority responsible for implementing these measures is the National Public Health and Officer Service who indicates the area around a human case and engages a company to carry out the disinfestations.

To date, such mosquito control measures have not been employed in connection with WNV, but only with the aim to decrease the mosquito population in tourist areas and in cases of imported malaria. No vector surveillance has been performed, either.

Background information

In Hungary it has been mandatory to notify cases of aseptic meningitis since 1950 and cases of infectious encephalitis since 1967. Serologic tests for lymphocytic choriomeningitis virus (LCMV), tick-borne encephalitis virus (TBEV), enteroviruses, West Nile virus (WNV) and herpes simplex virus (HSV) have been performed already since the 1950s and 1960s to determine the etiology of these diseases.

Since 2004, laboratory analysis for WNV has been performed not only in cases of suspected WNV infection or in cases of meningitis or encephalitis upon the request of the clinician, but also following negative results of diagnostic testing for more common infections such as tick-borne encephalitis or lymphocytic choriomeningitis.

Between 2003 and 2007 a yearly average of six cases of WNV neuroinvasive infection were diagnosed by the reference laboratory. Although none of the cases diagnosed by the laboratory were fatal, severe illness can develop in those patients who have flavivirus antibodies (e.g. anti-WNV) if they become infected by another flavivirus (e.g. TBEV) [4].

In a seroprevalence study conducted in Hungary in 1999 the presence of WNV antibodies was found in 30 of the 5,312 persons examined (0.56%) [5]. The majority of people with antibodies were residents of the south-eastern part of the country (Alföld), including Pest, Jász-Nagykun-Szolnok, Hajdú-Bihar, Bács-Kiskun, Csongrád and Békés counties. As now the virus has also appeared in TBEV endemic western territories of the country (such as Győr-Moson-Sopron, Vas, Veszprém and Zala counties), more caution is needed to avoid the antibody-dependent enhancement phenomenon (e.g. controlled vaccination against TBEV of persons previously infected by WNV).

Conclusion

The activity of the vector as observed at the end of the season has been very low, so further new cases of WNV infection are not expected to occur this year. The number of cases registered this year has been higher than in the past five years but still rather low. Nevertheless, it is important to improve the detection and control procedures to better respond to the changing epidemiological situation. Faster laboratory diagnosis would enable a more timely implementation of response measures. The results of serological analysis used for confirmation of WNV cases are in most cases too late to apply control measures. For this purpose it is very important to develop good collaboration with the veterinary sector to exchange information and undertake joint actions. At present the Ministry of Health and the National Centre for Epidemiology are preparing to sign an agreement with the Ministry of Agriculture, regarding collaboration with the veterinary authorities, in particular exchange of information and vector control measures.

Our experience has also revealed the need for clear and feasible EU regulations regarding blood donation that would guarantee safety but not jeopardise the blood supplies.

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Rapid communications

A case of ciguatera fish poisoning in a French traveler

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Ciguatera is a toxic poisoning due to ingestion of fish and is rarely reported in France. Little is known about this imported tropical disease. We present a case observed in Paris in a traveller returning from the Dominican Republic.

Case description

The patient was a man in his late thirties who stayed in a hotel-club of Puerto-Plata, Dominican Republic, during two weeks in August 2008. On 17 August, about four hours after eating fish, he complained about abdominal cramps and diarrhoea. The patient's wife who had not eaten fish did not have any symptoms. In contrast, a friend of the patient's who had consumed the same fish presented similar symptoms with vomiting. These gastro-intestinal symptoms persisted for three days. General pruritus appeared 24 hours after the beginning of the disease preventing him from sleeping. Headache, arthralgia, myalgia and paraesthesia of mouth and extremities occurred at the same time.

After his return to France, the patient presented at our hospital on 3 September. He still had pruritus with scratching laesions, arthralgia, myalgia and weakness. Routine laboratory tests (blood cell counts and biochemical values) were normal and examination of stool samples for parasites was negative. The diagnosis of ciguatera poisoning was made on the basis of the epidemiological data and the association of gastro-intestinal and neurological symptoms. The species of ingested fish could not be specified. The patient remembered only that it was "a big fish". Despite symptomatic treatment, pruritus and asthenia were still present seven weeks after the exposure.

Discussion and conclusion

Ciguatera is the commonest marine poisoning, endemic in tropical zones of the Pacific, Indian and Atlantic oceans [1]. The origin of ciguatoxins is gambiertoxins produced by marine dinoflagellates, in particular *Gambierdiscus toxicus*. Ciguatoxins are lipid-soluble, heat-stable and not destroyed by freezing and cooking. This class of polyether toxins acts by opening the sodium channels in the nerve cell membranes. Ciguatoxins are accumulated in the flesh and viscera of herbivorous fish, which in turn are ingested by larger carnivorous fish which then cause the intoxication in humans.

Many reef fish species have been associated with the disease [1]. An increasing number of ciguatera outbreaks has been reported in the past years in endemic areas. This increase could be explained by the damages to coral reefs and climate modifications [2]. Main Pacific ciguatoxin is much more toxic than the Caribbean one.

In the absence of reliable tests, the diagnosis is based on the succession of gastro-intestinal and neurological symptoms. Gastrointestinal effects predominate in the Caribbean and neurological ones in the Indo-Pacific regions. Gastro-intestinal manifestations (abdominal cramps, diarrhoea, vomiting) start 6-12 hours after consumption of contaminated fish. Neurological and sometimes psychiatric symptoms appear 24-72 hours later, with weakness of the limbs, perioral paraesthesia and dysaesthesia being the most common symptoms suggestive of the intoxication [1,3]. Myalgia, arthralgia, headache, ataxia and dizziness can also be observed. Other manifestations include asthenia, pruritus, cutaneous rash, eye and dental pain, and dysuria. In severe cases, cardiovascular disorders (hypotension, bradycardia) can occur, mortality is low. The evolution of ciguatera poisoning is sometimes chronic, associated with depression and persistent asthenia.

Treatment is only symptomatic and requires hospitalisation in severe cases. Mannitol therapy had been proposed as the treatment of choice, but this statement was not confirmed by a double-blind randomised trial. Preventive measures are essential in endemic areas in order to reduce the incidence of the intoxication. The main recommendation is to avoid consumption of large reef fish.

Ciguatera poisoning has been identified in North American travellers for many years [4]. More recently, it has also emerged in travellers from several European countries [5,6,7]. Most of them were returning from the Caribbean, mainly the Dominican Republic and Cuba. In the Paris area, ciguatera poisoning remains a rare and probably under-recognised imported disease. Of 622 adult patients who consulted a tropical disease unit after returning from the tropics, ciguatera poisoning was diagnosed only in five (0.8 %) [8]. The patient described here is the first case observed in a period of 10 years in the department of infectious diseases and tropical medicine. Another patient returning from Vietnam was observed in another department of our hospital last year. The diagnosis was delayed because of the predominant neurological clinical presentation. The main symptom was cold allodynia. A neurologist consultant finally made the diagnosis because of this pathognomonic feature and the exposure history.

Ciguatera is probably more frequent than it is reported due to the lack of knowledge of the disease by French practitioners. European clinicians need to be familiar with diagnosing ciguatera intoxication because the illness has been reported in the United Kingdom and France among patients that did not have a history of travel to the tropics, implicating imported fish as the source [9,10]. Travellers visiting ciguatera-endemic areas should be warned by travel clinics and tour operators about the risk of fish poisoning and advised that the risk of ciguatera intoxication can be reduced by avoiding consumption of reef fish and large ocean predators (e.g. shark, barracuda).

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Rapid communications

Invasive meningococcal disease with fatal outcome in a Swiss student visiting Berlin

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Following the fatal invasive meningococcal disease in a Swiss student who had been visiting Berlin, several public health institutions on local, regional and national level cooperated to ensure that the appropriate measures such as contact tracing and post exposure prophylaxis were taken to prevent further cases. The incidence highlighted the importance of early disease notification and showed that if an infectious disease requiring public health action occurs in an international context, it is vital that relevant information is communicated to all levels of the public health systems of the countries involved.

An 18 year-old Swiss student travelled to Berlin on a class trip by night train on 12/13 October 2008, where the group stayed at a hostel. During the night from 17 to 18 October, the student complained of severe headache, back pain and vomiting and presented at a local hospital on 18 October, where invasive meningococcal disease was diagnosed by culture in blood and cerebrospinal fluid. Despite intensive care measures, the patient died on 20 October. The isolate was sent to the German National Reference Centre for Meningococci, where the serogroup was determined as W135.

Contact tracing and measures to prevent further cases

Switzerland

The patient's classmates returned to Basel, Switzerland by night train on 18 October. Before returning, the travel group informed the Cantonal Health Department in Basel about the situation and chemoprophylaxis was provided to the students immediately upon their arrival. The students were counselled by the child and youth health division of the cantonal health department and a letter was sent out to parents. Close household contacts of the patient, who had stayed in Basel received chemoprophylaxis one day later. In addition, a press release informing about the case and the chemoprophylaxis that had been carried out was issued by the cantonal health department in Basel on 20 October.

Germany

The hospital in Berlin where the patient was treated notified the case to the local district health department by fax on Sunday, 19 October, which in turn informed the Berlin Senate Department for Health, Environment and Consumer Protection (state level) and the Robert Koch-Institute (RKI) on 20 October 2008. Furthermore, a message about the incident was posted on the Early Warning and Response System (EWRS) on 21 October by the RKI.

In the course of the ensuing contact tracing, information was repeatedly exchanged between the local health departments in Berlin and Basel on 20 October. The Berlin health departments issued a first press release on 21 October informing about the case. Investigations revealed that a young woman who was not part of the Swiss travel group had travelled to Berlin in the same train compartment as the patient. In addition, the patient had visited a local nightclub on 15 and 17 October, where classmates described close contact with several persons not part of the travel party. The local Berlin health authority therefore issued a second press release later on 21 October informing about symptoms and transmission of meningococcal disease and requesting the young woman who had travelled to Berlin in the same compartment, whose first name appeared in the press release, as well as persons who had had close contact with the patient in the club, to contact the local health department for assessment of the need for chemoprophylaxis.

The investigations revealed that the patient had had breakfast in a common room at the hostel together with travel groups from three German federal states as well as from the Netherlands. Although it was unlikely that close contact with the patient beyond possibly sharing the same table at breakfast had taken place, the supervisors of the travel groups, the respective German state health departments and the national public health institute in the Netherlands were informed about the case on 21 October. The respective federal state or country authorities were provided with information about the travel parties, including contact information for the group supervisors, to enable an assessment of the possible need for chemoprophylaxis and appropriate counselling by the responsible health authorities. A number of individual travellers from Germany and from other European countries also stayed at the hostel. However, as the investigations did not indicate close contact between the patient and these travellers, further contact tracing was not initiated. No secondary cases have occurred to our knowledge.

In response to a large number of queries from the public and the media, the local health department established a public telephone hotline on 21 October. In addition, a third press release was issued by the Berlin health authorities on 22 October, which again informed about symptoms and transmission of meningococcal disease, and reported that close contacts of the patient during her visits to the club had contacted the health department and had been advised to obtain chemoprophylaxis. The young woman travelling to Berlin in the same compartment as the patient also contacted the health department and received chemoprophylaxis.

Discussion

This incident illustrates that close cooperation between German and Swiss health authorities led to rapid identification of potential close contacts. However, as the case was notified on a Sunday, contact tracing in Berlin was delayed until Monday morning and informing potential close contacts that had already left the hostel was not possible until 21 October, three days after the last potential contact with the infectious patient. Perhaps because of the excellent communication between the health departments in Berlin and Basel, and because of the reporting via EWRS, German authorities neglected to directly inform the national health authority in Switzerland, which does not have access to EWRS. In addition, neither the German nor the Swiss authorities informed each other in advance of the press releases they issued. Therefore, this event shows that there is still room for improvement concerning the international information exchange. More efficient communication within the European region could be achieved if Switzerland was to participate in the EWRS.

Moreover, this case illustrates the difficulty of deciding which persons require chemoprophylaxis. It is well established that short-term treatment with rifampicin, ciprofloxacin or ceftriaxone eradicates carriage of meningococci in the nasopharynx [1] and lowers the risk of secondary cases in household contacts [2]. Evidence that chemoprophylaxis lowers the risk of secondary cases in other settings is less strong, but it is generally agreed that contact with nasopharyngeal secretions, as might occur during kissing or after close contact in a confined space (such as during travel) warrants chemoprophylaxis, although there is heterogeneity in the definition of close contacts, as well as in duration and proximity criteria for fellow travellers/contacts of cases, among European countries [3]. In this case, chemoprophylaxis was definitely considered to be warranted in fellow classmates and persons who had had close contact with the patient in a club and during an overnight trip in the same train compartment, as the latter had taken place less than seven days prior to symptom onset. Assessment was more difficult with regard to the other inhabitants of the hostel, although close contact was unlikely to have occurred by having breakfast in the same room or even at the same table. It was left to the discretion of the responsible health authorities to assess whether close contact with the patient might, nonetheless, have occurred or could be ruled out. It turned out that all nine students and three supervisors of one of the German travel groups obtained chemoprophylaxis in Berlin on their own initiative prior to their departure on 22 October; while local health authorities decided that chemoprophylaxis was not necessary for members of the remaining two travel groups from Germany or the Dutch group. No secondary cases occurred in these groups as documented by follow-up as of 31 October.

Conclusion

In summary, this occurrence of fatal invasive meningococcal disease in a Swiss student while visiting Berlin highlights the importance of early disease notification. In addition, all levels of the public health system should be accessible and ready to respond at all times. Excellent communication between local health departments in Berlin and Basel led to successful identification of close contacts across European borders. When an infectious disease requiring public health action occurs in an international context, it is vital that relevant information is communicated to all levels of the public health systems of the countries involved.

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A swimming pool-associated outbreak of cryptosporidiosis in Staffordshire, England, October to December 2007

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In October 2007 an increase in laboratory-confirmed cryptosporidiosis cases in Staffordshire, England prompted an outbreak investigation. Case ascertainment included interviewing suspected cases and contacts and obtaining faecal specimens from those with diarrhoea for laboratory identification. Over a three-month period we identified 57 cases of cryptosporidiosis (39 confirmed) distributed across 36 households. The majority of cases (69%) were younger than 20 years. The most plausible exposure was multiple swimming episodes (56% of cases) in 13 local public swimming pools. One large swimming pool was most frequently visited by swimmers and considered a significant contributor to transmission because of substandard filtration and maintenance systems. Control measures focused on inspecting and improving operating standards at swimming pools, hygiene information to swimmers, and early detection and exclusion of cases. The rapid case investigation described in this paper provided adequate information for the early detection and control of a typical seasonal swimming pool related cryptosporidiosis outbreak. Ensuring adequate filtration standards at public swimming pools particularly before the high use periods of late summer and autumn remains a priority.

Introduction

The improvement of water treatment systems in England and Wales has resulted in fewer drinking water-related cryptosporidiosis outbreaks in recent years [1]. By contrast, swimming pool-associated outbreaks continue to occur, with incidence peaking in late summer and autumn when swimming pool use is highest [2]. Outbreaks linked to interactive water features have also increased in prominence [3].

In November 2007 laboratory surveillance indicated a fourfold increase of cryptosporidiosis cases in northern Staffordshire, England, compared to 2006 data (16 vs. 4 cases). Routine questioning of cases by environmental health officers revealed all had recent public swimming pool exposures. We undertook a rapid case investigation aimed at targeting timely and appropriate control measures.

Methods

The University Hospital North Staffordshire microbiology laboratory serves the northern Staffordshire population consisting of approximately 500,000 residents.

A confirmed case of cryptosporidiosis was defined as any northern Staffordshire resident with diarrhoea confirmed by the detection of *Cryptosporidium* oocysts in a stool sample by microscopic examination, from 15 October to 24 December 2007.

A probable case was defined as any household or close contact of a confirmed case presenting with watery diarrhoea or diarrhoea plus abdominal cramps with nausea and/or vomiting from 15 October to 24 December 2007.

An outbreak management team consisting of public health investigators, microbiologists, environmental health officers, and a media officer was convened to oversee the investigation and the implementation of control measures. We alerted local general practitioners and acute care hospital practitioners to be vigilant and encourage confirmatory testing of suspected cases, and to give patients appropriate hygiene and exclusion advice. Public health officers used a standardised questionnaire to interview the cases in person or over the telephone. Children were interviewed with an adult family member present. Exposure data included sources of drinking water, recreational water exposure including swimming, food consumption, animal contact and recent travel. Cases and their close contacts were given detailed advice on hygiene measures, exclusion from work or school if indicated, and exclusion from swimming until 14 days after last symptoms [4].

Further probable cases were identified through the investigation of family members and close contacts of cases, and encouraging those with symptoms to submit faecal samples.

Laboratory and interview data were captured anonymously in a line listing and analysed descriptively using EPIData statistical software (Version 2) [5].

Swimming pools identified during questioning of cases were inspected by environmental health officers against the standards laid down by the Pool Water Treatment Advisory Group (PWTAG) [6]. Water samples were not taken from individual pools for *Cryptosporidium* testing, as control interventions were implemented without delay based on pool inspection results.

Primary laboratory diagnosis was based on the demonstration of *Cryptosporidium* oocysts in stool specimen, using the modified Ziehl-Neelsen stain [7]. A number of samples positive for oocysts were submitted for confirmation and species identification at the UK Cryptosporidium Reference Unit. Oocysts separated from faecal debris by saturated salt flotation were disrupted at 100 ºC for 60 minutes, digested with proteinase K in lysis buffer at 56 ºC and deoxyribonucleic acid (DNA) extracted by spin-column filtration (QiaAMP DNA mini kit, Qiagen) [8]. DNA was routinely subjected to polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) of the *Cryptosporidium* oocyst wall protein (COWP) gene in the first instance and a subset confirmed by PCR-RFLP using nested primer sets for the small subunit ribosomal ribonucleic acid (SSU rRNA) gene [9,10].

Results

Thirty nine confirmed cases were identified. Their median age was 13 years with a male: female ratio of 1.2. Twenty seven (69%) cases were younger than 20 years with males (18/27) predominating (Figure 1). The distribution of symptom onset dates for confirmed cases is given in Figure 2. Confirmed cases were distributed across 36 households. An additional 18 probable cases were identified in these 36 households yielding a total of 57 cases. Three households each had a second confirmed case representing likely transmission between siblings.

Six confirmed cases (three of them less than 15 years old) were admitted to hospital for treatment.

With the help of the two water companies supplying domestic water to northern Staffordshire we were able to confirm that cases were distributed over several separate raw water supply and quality zones. Domestic water could therefore be excluded as a potential source of infection at the outset of the investigation. Confirmed cases reported no swimming in open water sources (rivers, ponds). Cases had minimal exposure to other non-swimming pool potential sources of infection: three had visited a zoo or livestock farm; three had contact with a sick pet; and seven reported recent travel abroad.

Twenty two (56%) confirmed cases reported recent swimming at one or more of the 13 local swimming pools prior to onset of symptoms. The median time from exposure to swimming pool water to onset of symptoms was seven days (range 1 to 25 days), representing an approximate incubation period. These 22 swimming pool-exposed cases were distributed across 20 households, with two households each having a second case. Eight cases confirmed swimming in more than one swimming pool, others frequented one place only. Pool A (a large and very busy water theme park) was visited on at least one occasion by 14 cases. Eight of these 14 cases swam exclusively at Pool A. Thirteen of the cases with pool A exposure attended weekend swimming disco or Halloween parties organised at the pool between 26 October and 17 November 2007.

Faecal samples from 22 cases (including nine with swimming pool exposure) were submitted for species identification. Four were *Cryptosporidium parvum* (of which one case had swimming pool exposure but not at pool A); and 18 were *Cryptosporidium hominis* (of which eight had swimming pool exposure – four exclusively at pool A and four at other pools). Three of the cases with no swimming exposure in which C. hominis was identified were pre-school siblings of cases with the same infection and swimming exposure at pool A.

In 17 cases (13 reporting swimming pool exposure) species identification was not requested and a meaningful analysis of species type association with individual swimming pools could not be undertaken.

Pool A was inspected during the last week of November 2007 and found not to have adequate sand filtration depth, continuous coagulant dosing, flow rate monitoring, and backwashing routines. Policies for pool evacuation and decontamination following faecal incidents were not in place. Urgent remedial measures were instigated and hygiene conditions improved. Subsequently, all other public and school swimming pools were also inspected and found to have adequate filtration standards but variable faecal incident policy standards and uptake. Bacteriological standards at all 13 swimming pools were within acceptable limits.

Discussion and conclusion

This outbreak of 39 confirmed and 18 probable cases of cryptosporidiosis had a significant impact on the affected population and households in terms of hospitalisation and absence from schooling or work. We believe that swimming parties at pool A, coupled with ineffective filtration systems and large numbers of

Figure 1

Age and sex distribution of confirmed cryptosporidiosis cases, Staffordshire, England, October to December 2007 (n = 39)

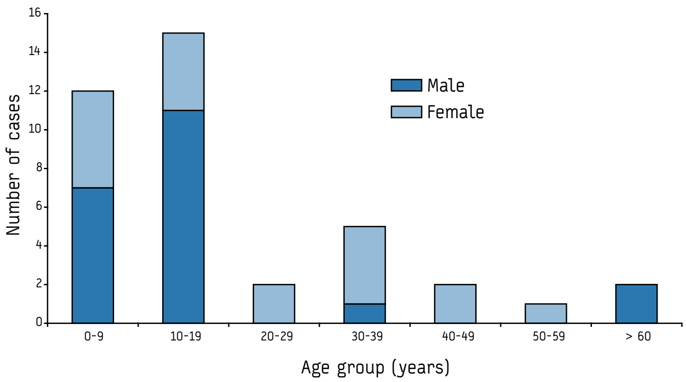
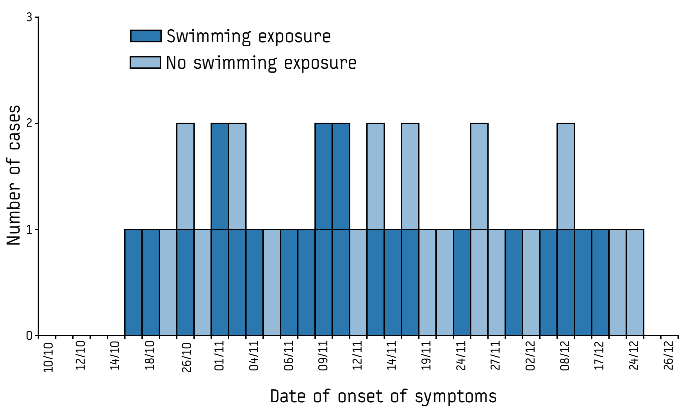


Figure 2

Confirmed cryptosporidiosis cases, by swimming pool exposure and date of onset of symptoms, Staffordshire, England, October to December 2007 (n = 39)



visitors, contributed to the early part (first 5 weeks) of the outbreak. Not surprisingly, the incidence of infection was highest in younger age groups who swam often and at a variety of different swimming pools. Although difficult to verify due to sampling limitations, C. hominis was likely to be most associated with swimming pool exposure during the initial stages of the outbreak. Secondary household transmission contributed to the size of the outbreak and was probably underreported. The role of travel exposure appeared to be limited but had been an important factor at the onset of other similar outbreaks [11].

Outbreaks associated with several swimming pools are often prolonged and difficult to investigate due to multiple exposures and incomplete case ascertainment [11,12]. We were limited in our ability to fully investigate the contribution of other exposures, such as private swimming pools and common food sources, that could have accounted for some cases. It is likely that more severe cases were overrepresented in this outbreak. Despite this limitation, the laboratory based surveillance system proved reliable in detecting the outbreak. Coupled with rapid case investigation, we were able to identify public swimming pool exposure as the most likely cause of the outbreak and implement control measures. Improved hygiene measures at Pool A could not be implemented early enough in the outbreak to impact on disease incidence, but are in place for the next season.

Developing a pre-emptive approach to seasonal swimming pool-associated *Cryptosporidium* outbreaks is clearly feasible and important. The means for detection, prevention and control are readily available although often not implemented in time [11]. The existing guidance published by PWTAG should be followed and audited by swimming pool operators and local authorities to ensure adequate filtration systems, maintenance standards, and hygiene policies are in place well before the summer months [6,13]. One example of an auditing framework is that provided by the Institute of Sport and Recreation Management National Pool Safety Award [14]. Public health units are in a strong position to closely monitor *Cryptosporidium* incidence in anticipation of the seasonal swimming-related peak, and to rapidly communicate advice to clinicians and appropriate health messages to schools and the public.

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Research articles

The burden of genital warts in Slovenia: results from a national probability sample survey

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The objective of this study was to estimate the lifetime age-specific cumulative incidence of self-reported genital warts diagnosis in Slovenia and to explore the association with demographic characteristics and self-reported sexual behaviour. Data were collected in the period from November 1999 to February 2001 from a national probability sample of the general population aged 18-49 years through a combination of face-to-face interviews at the respondents' homes and anonymous self-completed questionnaires. In total, 849 men and 903 women were interviewed (response: 63.3% men, 70.9% women). Among sexually experienced respondents with available information (752 men and 842 women), previous diagnosis of genital warts was reported by 0.3% of men (95% confidence interval (CI): 0.0%-1.3%) and 0.4% of women (95% CI: 0.1%-1.1%), and in the age group of 40-49 year-olds by 0.5% of men (95% CI:0.0-3.2) and 0.7% of women (95% CI: 0.2%-2.9%). In comparison to women with fewer than 10 lifetime male partners, those who reported to have had at least 10 male partners were more likely to have a previous diagnosis of genital warts (adjusted odds ratio: 7.2 (95% CI: 1.1%-47.8%). The lifetime cumulative incidence of self-reported genital warts diagnosis among Slovenians was relatively low in comparison to other published estimates from probability sample surveys in the general population in European countries. Our findings will inform the Slovenian vaccination policy against human papillomaviruses (HPV) and contribute to a better understanding of the differences between European countries regarding the burden of genital warts.

Introduction

Anogenital infections with human papillomavirus (HPV) types 6 and 11 are responsible for almost all genital warts, in Slovenia as well as in other countries [1-3]. Prophylactic quadrivalent HPV vaccine has been shown to be highly effective in preventing anogenital disease, including genital warts, associated with HPV types 6, 11, 16, and 18 in young women [4]. Since this vaccine has recently become available, and many Member States of the European Union (EU) consider introducing HPV vaccination into their national immunisation schedules [5], understanding the burden of genital warts in the general population is important in order to make informed vaccination policy decisions. Few studies about the overall and age -specific lifetime cumulative incidence of self-reported genital warts diagnosis have been conducted in probability samples of the general population of European countries [6,7].

Surveillance of sexually transmitted infections in Slovenia, including genital warts, is based on mandatory notification of all diagnosed cases by clinicians. The annual reported incidence of newly diagnosed genital warts in the period from 2001 to 2007 was relatively low. The lowest rate, 3.5 per 100,000 general population, was reported in 2001, and the highest rate in 2002, with 6.7 per 100,000. The incidence in 2007 was 4.7 per 100,000 general population [8]. Although the sensitivity of our surveillance system has not been formally assessed, these reported rates are assumed to underestimate the true incidence [8].

We used data from the Slovenian national Sexual Lifestyles, Attitudes and Health Survey to estimate the overall and age-specific lifetime cumulative incidence of self-reported genital warts diagnosis in Slovenia and to explore the association with selected demographic characteristics and self-reported sexual behaviours.

Methods

Details on the employed methods have been published previously [9]. In brief, data were collected over the period between November 1999 and February 2001 from a national probability sample of the general population aged 18-49 years by a combination of face-to-face interviews conducted at respondents' homes and anonymous self-administered pencil and paper questionnaires. The data collection methods were an adaptation from the British National Survey of Sexual Attitudes and Lifestyles conducted in 1990 and have been thoroughly piloted in Slovenia [10,11]. They were very similar to the methods used in the second British survey conducted in 2000 [6,12]. Ethical approval was obtained from the Medical Ethics Committee of the Republic of Slovenia. Informed consent was obtained from each study participant.

We used stratified two-stage probability sampling. Individuals aged between 18 and 24 years were sampled with twice the probability of older individuals. The sampling frame was designed using the list of enumeration areas provided by the Central Population Registry. Within each of the 12 statistical regions of Slovenia, communities were implicitly stratified according to their type and size as follows: rural communities with less than 2,000 inhabitants, non-rural communities with less than 2,000, communities with 2,000-9,999 inhabitants, those with 10,000-100,000, and two cities with more than 100,000 inhabitants. The entire sampling frame included 9,850 primary sampling units of approximately 120 inhabitants at 18-49 years of age. 270 primary sampling units were sampled independently from the 12 regions with the probability proportional to the size of the eligible population, which was defined as the sum of the individuals at 25-49 years of age and twice as many individuals at 18-24 years of age. On average, 10 individuals at the age of 18-49 years were randomly selected from each unit.

Questions about demographic characteristics and first heterosexual intercourse were asked in face-to-face interviews. Only those who reported any sexual experience were asked to anonymously complete self-administered questionnaires that included questions on the details of sexual lifestyles, risk behaviours and previous diagnosis of sexually transmitted infections. The question designed to estimate age-specific lifetime cumulative incidence of self-reported genital warts diagnosis was: "Have you ever been told by a doctor that you have genital warts?"

Weights were computed to adjust for over-sampling of the age group of 18-24 year-olds and the differences in survey response between different regions, and different types and sizes of communities. A multidimensional calibration procedure was applied to adjust for any remaining differences between the achieved sample and available Slovenian population estimates according to statistical regions, types of communities, and gender and age groups, based on Central Population Registry data for the year 2000.

Analyses were conducted using STATA version 7.0 statistical methods for complex survey data (svy commands) to account for stratification, clustered sampling, over-sampling of 18-24 year-olds. Response rates were calculated from unweighted data. Weighted estimates of cumulative proportions of respondents who reported genital warts diagnosis, overall and according to different demographic and sexual behaviour characteristics, were obtained together with 95% confidence intervals (CI). Tests for independence for complex survey data (the Pearson chi-squared statistics corrected for the survey design) were computed. For women only, multivariate analyses of the association between self-reported genital warts diagnosis and marital status as well as having at least 10 heterosexual partners in one's lifetime (two variables associated with self-reported genital warts diagnosis in the univariate analyses, $p<0.05$) were performed by logistic regression accounting for complex survey design (svylogit command) to obtain pseudo-maximum likelihood estimates of adjusted odds ratio (AOR) together with 95% CI, and adjusted Wald tests of significance.

Results

A total of 849 men (survey response: 63.3% of those selected) and 903 women (survey response: 70.9%) were interviewed. The 807 men and 874 women who reported sexual experience were asked to anonymously complete self-administered questionnaires.

The question for previous diagnosis of genital warts was answered by 752 sexually experienced men and 842 sexually experienced women (item response: 93.2% among men; 96.3% among women). Overall, two men and three women (unweighted counts) reported previous diagnosis of genital warts. Table 1 shows the proportions of those who reported previous diagnosis of genital warts, overall and by selected demographic characteristics and sexual behaviours with the results of univariate analyses of association (p values). Previous diagnosis of genital warts was reported more often by

Table 1

Proportion (cumulative incidence) of sexually experienced* men and women aged 18-49 years who reported previous diagnosis of genital warts, Slovenia, 1999-2001

	Men				Women			
	% (95% CI)	Base WT	Base UWT	p value†	% (95% CI)	Base WT	Base UWT	p value†
All	0.3 (0.0 - 1.3)	801	752		0.4 (0.1–1.1)	823	842	
Age				0.58				0.37
18-29 years	0	280	363		0	283	381	
30-39 years	0.5 (0.0 - 3.7)	254	174		0.4 (0.0–2.7)	265	235	
40-49 years	0.5 (0.0 - 3.2)	268	215		0.7 (0.2–2.9)	276	226	
Marital status				0.55				0.04
Married/cohabiting	0.5 (0.1 - 2.1)	497	391		0.3 (0.0 – 1.3)	605	553	
Widowed/separated/divorced	0	17	12		2.9 (0.4 -18.4)	34	27	
Single	0	286	349		0	184	262	
Heterosexual partners in lifetime				0.58				0.04
Less than 10	0.3 (0.0 – 1.8)	547	528		0.3 (0.0 – 1.1)	762	778	
10 or more	0.5 (0.1 – 3.7)	227	203		2.1 (0.3 -13.8)	47	49	
Concurrent heterosexual partners				0.07				0.41
Never	0	454	439		0.3 (0.0 – 1.2)	658	668	
At least once	1.0 (0.2 – 3.7)	271	245		0.8 (0.1 – 5.6)	123	133	

* Sexually experienced respondents are defined as those who reported to have had sexual intercourse (oral, vaginal or anal).
† Pearson's chi-squared statistics corrected for the survey design were computed (univariate analyses of association between self-reported genital warts diagnosis and selected demographic and sexual behaviour characteristics).
CI: confidence interval; WT: weighted count of individuals; UWT: unweighted count of individuals.
Numbers of individuals (bases) vary according to the number of missing values for individual variables.
The data were weighted to be representative of the Slovenian population based on the Central Population Registry data for the year 2000 and analysed using STATA version 7.0 to account for complex survey design (stratification, clustered sampling, over-sampling of 18-24 year-olds).

older than by younger respondents: by 0.5% of the 40-49 year-old men (95% CI: 0.0-3.2) and by 0.7% of the 40-49 year-old women (95% CI: 0.2-2.9).

We found no evidence of association of previous genital warts diagnosis with the level of education, first heterosexual intercourse before the age of 16, having ever paid for sex, or condom use.

In multivariate analysis, women with at least 10 lifetime partners had higher odds of previous genital warts diagnosis (AOR (adjusted for marital status): 7.2 (95% CI: 1.1-47.8)) in comparison to those with fewer than 10. In comparison to married/cohabiting and single women, women who had been married previously were also more likely to have a previous genital warts diagnosis (AOR (adjusted for 10+ lifetime partners): 5.8 (95% CI: 0.9-38.8)); however, the statistical significance was borderline (p=0.07).

Discussion and conclusion

Our findings indicate a relatively low overall and age-specific lifetime cumulative incidence of self-reported genital warts diagnosis in the general population of Slovenia.

The lifetime cumulative incidence of self-reported genital warts seems to vary substantially between European countries. In the general population probability sample of 16-44 year-old British men and women interviewed in 2000, 3.6% (95% CI: 3.1-4.2) of sexually experienced men and 4.1% (95% CI: 3.6-4.7) of sexually experienced women reported ever being diagnosed with genital warts [6]. In the general population probability sample of 18-45 year-old women interviewed in the period 2004-2005 in four Nordic countries, clinically diagnosed genital warts were reported by 10.1% (95% CI: 9.7-10.5) in Denmark, 12.0% (95% CI: 11.5-12.6) in Iceland, 9.5% (95% CI: 9.0-9.9) in Norway, and 11.3% (95% CI: 10.8-11.8) in Sweden [7]. These differences in the estimated lifetime cumulative incidence of self-reported genital warts between the studies in Slovenia, the United Kingdom (UK) and the Nordic countries are consistent with a recent review on the epidemiology of sexually transmitted infections in the European Union which concluded that the prevalence of herpes simplex virus type 2 (HSV-2) in Scandinavia was higher than in other countries [13].

Differences in sexual behaviours may contribute to the differences in the lifetime cumulative incidence of self-reported genital warts diagnosis between these European countries. The occurrence of genital warts has been linked to higher-risk sexual behaviours, most often with higher numbers of sexual partners [7,14,15]. Both of the above-mentioned European studies conducted in general population probability samples, reported higher mean numbers of lifetime sexual partners than our study (see Table 2).

Table 2

Estimates of mean numbers of lifetime sexual partners from surveys conducted in representative samples of general populations in selected European countries

Country	Mean numbers of lifetime sexual partners		Year of study	Reference
	Men	Women		
United Kingdom	12.7	6.5	2000	[12]
Denmark	n.i.	8.4	2004-2005	[7]
Iceland	n.i.	8.8		
Norway	n.i.	7.4		
Sweden	n.i.	8.6		
Slovenia	8.3	3.2	1999-2001	Unpublished results

n.i.: not included in the study.

Our results provide some evidence that Slovenian women with at least 10 lifetime male partners were more likely to have a previous genital warts diagnosis than those with fewer partners. Since the numbers were small and we used logistic regression accounting for the complex survey design (svylogit command) to obtain pseudo-maximum likelihood estimates of adjusted odds ratio (AOR) together with 95% CI and adjusted Wald tests of significance, it is possible that the statistically significant association we calculated may have been an association of only borderline significance. The lack of evidence in our data for an association of previous genital warts diagnosis with the level of education, first heterosexual intercourse before the age of 16, having ever had concurrent heterosexual partnership, having ever paid for sex, and condom use may be due to the relatively low prevalence of self-reported genital warts diagnosis as well as the relatively small sample size.

We may have underestimated the true overall and age-specific lifetime cumulative incidence of genital warts among Slovenian men and women due to the survey limitations that include validity constraints of self-reported information and to possible participation biases inherent to all behavioural surveys. Another possible factor is under-diagnosis caused by people that do not consult a doctor for genital warts or by barriers with respect to referral to sexually transmitted infections (STI) outpatient clinics. The ability to self-diagnose genital warts, a precondition to seeking health care, has been questioned [14]. However, we have no reason to believe that differences of such magnitude exist between general populations of Slovenia, Britain and Nordic countries with regards to the ability to self-diagnose genital warts, health-care seeking behaviour or access to STI outpatient clinics. Nor do we think that the ability to recall a previously diagnosed episode of genital warts or the number of lifetime sexual partners is responsible for the differences between these European studies [6,7,12].

It is noteworthy that our estimates, for both men and women, of the self-reported lifetime cumulative incidence of any STI (rather than of genital warts only), although still lower, were closer to the estimates obtained in the British survey (Slovenian men: 5.5%; Slovenian women: 5.1%; British men: 10.8%; British women: 12.6%) [6,17]. Further, the measured prevalence of sexually transmitted Chlamydia trachomatis infection among sexually experienced Slovenians aged 18-24 years in our survey was substantial, at 4.7% (CI 2.5%-8.5%) in both sexes, while the corresponding estimates for the UK were appreciably lower, with 2.7% (CI 1.2%-5.8%) among men and 3.0% (CI 1.7%-5.0%) among women, although the differences between the two countries were not statistically significant [6,18].

In conclusion, we found a relatively low lifetime cumulative incidence of self-reported genital warts diagnosis among Slovenian men and women in comparison to other published estimates from general population probability sample surveys in European countries. Differences in high-risk sexual behaviours may have contributed to these differences. Our findings will inform the Slovenian HPV vaccination policy as well as broader sexual and reproductive health policies. Our results also contribute to a better understanding of the differences in the burden of genital warts between European countries and may inform mathematical models aimed at projecting the long-term benefits and costs of vaccination with prophylactic quadrivalent HPV vaccine.

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Perspectives

Developing the Community reporting system for foodborne outbreaks

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Investigating and reporting of foodborne outbreaks became mandatory with Directive 2003/99/EC. In 2006 and 2007 the Community reporting system for foodborne outbreaks was further developed in an interdisciplinary approach, which is described in this paper. This involved experts on investigating and reporting foodborne outbreaks as well as experts on communicable diseases in addition to the European Food Safety Authority (EFSA) Task Force for Zoonoses Data Collection, the European Centre for Disease Prevention and Control (ECDC) Advisory Forum and representatives of ECDC, the World Health Organization (WHO), the World Organization for Animal Health (OIE) and the European Commission. European Union Member States participated in a survey regarding their national reporting systems and the needs for information on foodborne outbreaks at the Community level. The acceptability, the functionality and the data quality of the current reporting system were evaluated. The results were used to propose new variables on which data should be reported. Pick-lists were developed to facilitate reporting and better integration of the Community system with Member States' reporting systems. The new system is expected to yield better quality data on foodborne outbreaks relevant for risk assessment and risk management while reducing the work load for Member States.

Introduction

Protection of human health against diseases and infections transmissible directly or indirectly between animals and humans (zoonoses) is of paramount importance. In order to assess the priorities for preventive action against zoonoses in the European Community, the European Union (EU) Member States have been obliged since the end of 1993 to collect data on the trends and sources of zoonotic infections in the human population and on the occurrence of zoonotic agents in animals, food, and animal feed [1].

Foodborne outbreaks, if thoroughly investigated, provide the possibility to identify the pathogen, the food vehicle involved and the factors in the preparation and handling of food that contributed to the outbreak. Therefore, it was considered appropriate to make provision for such investigations and for close cooperation between the various authorities when a new "Zoonoses directive" was developed in 2003. The Directive 2003/99/EC of the European Parliament and of the Council on monitoring of zoonoses and zoonotic agents [2] requests the EU Member States to investigate foodborne outbreaks and to transmit each year to the Commission a summary report of the results of the investigations carried out. The European Food Safety Authority (EFSA), who is assigned the task to collate, analyse and report the data collected, developed a reporting system for foodborne outbreaks in 2003. When the reporting of foodborne outbreaks became mandatory in 2005, EFSA with the assistance of its Foodborne Outbreak Contractor, the Bundesinstitut für Risikobewertung (Federal Institute for Risk Assessment, BfR), and in collaboration with the European Centre for Disease Prevention and Control (ECDC) further developed the Community reporting system for foodborne outbreaks.

This report describes the activities undertaken in this context and summarises their results.

Methods

A survey was conducted with the aim to investigate the national reporting systems for foodborne outbreaks currently in place in the Member States and to establish the need for collecting further information on foodborne outbreaks at the Community level.

Following this, the current Community reporting system for foodborne outbreaks was evaluated regarding its acceptability, data quality and sensitivity.

The results of the questionnaire survey and the evaluation were used in further developing the Community reporting system for foodborne outbreaks.

Questionnaire survey

Two questionnaires were prepared for the survey. In the first questionnaire, the recipients were asked to describe the structure of their national reporting system for foodborne outbreaks, how foodborne outbreaks were investigated and results of those investigations reported. In the second questionnaire, the recipients were asked to prioritise proposed objectives of the improved Community reporting system for foodborne outbreaks and to list other objectives they considered important. They were also requested to prioritise possible new parameters on which data should be reported to the Community level through the improved Community reporting system.

Both questionnaires were sent to representatives of the EU Member States and other European countries participating in the EU data collection (30 countries in total were contacted). They were asked to further distribute the questionnaires among the relevant institutes and persons in charge of the reporting of foodborne outbreaks in their country, and to return the completed forms. In addition, representatives of the European Commission, a number of international organisations and networks, and EFSA scientific panels were asked to complete the second questionnaire only.

Completed questionnaires were analysed at the BfR. The absolute and relative frequencies were calculated for all response options given in the questionnaires. In addition, for each of the general objectives and parameters of the improved reporting system given in the second questionnaire on information needs, scores were calculated by multiplying the frequency with which an objective had been assigned a priority level with the rank of the priority level ("High priority" = 2, "Low priority" = 1, "No need" = 0).

Evaluation of the reporting system

The current reporting system was evaluated by the Foodborne Outbreak Contractor (BfR) by assessing the data on foodborne outbreaks occurring in 2005 and submitted by Member States to the system before August 2006. The acceptability of the system was evaluated by calculating the overall participation rate of Member States, the submission rate for the respective reporting forms of the system and the completeness (represented by non-blank data fields) for all fields of the reporting forms. Data quality was evaluated by assessing the validity and the completeness of data submitted through the reporting forms. The sensitivity of the system relative to the sensitivity of national reporting systems was estimated for a subset of countries by comparing data on foodborne outbreaks submitted to the Community reporting system with data on foodborne outbreaks published in national bulletins, national annual reports and peer-reviewed journals.

Developing the reporting system further

A working group on foodborne outbreaks was set up by EFSA with experts on food safety and public health as well as representatives of ECDC, the World Health Organization (WHO), the World Organization for Animal Health (OIE) and the Directorate General for Health and Consumer Protection of the European Commission. Its task was to identify the need for reporting more information on foodborne outbreaks at the Community level and the availability of this data in the national reporting systems in Member States. The working group also analysed the results and the functionality of the current Community reporting system for foodborne outbreaks.

Based on their work, as well as the results of the questionnaire survey and the evaluation of the reporting system, a proposal for the improved reporting system was drafted. Subsequently, both the Task Force on Zoonoses Data Collection of EFSA and the Advisory Forum of ECDC were consulted and provided their comments, and the draft document was accordingly adjusted.

Results

Questionnaire survey

Twenty-six countries (response rate 87%) provided information on current national reporting system of foodborne outbreaks through the first questionnaire (27 systems were described, as one country provided information on two systems). In addition, 32 pick-lists of possible entries for a range of variables used in the national reporting systems were provided by 13 countries [3].

Thirty-five completed copies of the second questionnaire on information needs were received from representatives of 26 countries and two international bodies.

Foodborne outbreak reporting systems in place in the countries

All respondents confirmed that their country operated a reporting system for foodborne outbreaks, including waterborne outbreaks. All countries covered outbreaks caused by bacteria, viruses and parasites (n=26). Information on outbreaks caused by toxins were collected by 22 systems and data on outbreaks caused by chemicals by 10 systems. The majority of the national reporting systems were complex and involved several authorities. Eight countries claimed that there was close co-operation between public health and food safety/ veterinary authorities while five countries reported the establishment of national commissions or platforms for foodborne outbreaks aiming at improving the exchange of information and collaboration between the public health, veterinary and food safety authorities on zoonoses and, specifically, on foodborne outbreaks. Most countries recorded information on the number of human cases, the number of hospitalisations and deaths related to the outbreak. Many of them also differentiated between laboratory-confirmed and epidemiologically linked human cases and included age and gender of the cases (Table 1).

The incriminated food item could be reported as a free text in 17 of the systems. Five systems provided a default list with food items or categories from which the appropriate item could be picked and five systems offered both options. Most systems recorded the place of consumption and the place of preparation of the incriminated food, while the methods of food processing and food preparation were registered less frequently (Table 2). The most frequently stated shortcomings of the national reporting systems were the varying depths of outbreak investigations and the difficulties in tracing back the incriminated food.

Information needs at the Community level

The three objectives for data collection that received the highest overall score from all respondents were the identification and the monitoring of the food vehicles, the causative agents and the risk factors of foodborne outbreaks. Altogether 29 variables on which data should be collected through the improved Community foodborne outbreak reporting system were offered for prioritisation.

Table 1

Information on human cases involved in foodborne outbreaks covered by the national reporting systems (n=27)

Variable	Systems	
	n	%
Number of human cases in the outbreak	27	100
Number of deaths caused by the outbreak	25	93
Number of cases hospitalised	24	89
Number of laboratory confirmed human cases in the outbreak	22	82
Number of epidemiologically confirmed cases in the outbreak	18	67
Age of the person affected	18	67
Gender of the persons affected	18	67
Number of persons at risk	17	63
Number of laboratory confirmed clinical* cases in the outbreak	14	52
Number of laboratory confirmed asymptomatic cases in the outbreak	7	26
Number of person-days-in-hospital caused by the outbreak	3	11

n = number of national reporting systems collecting data on the variable
% = percentage of all reporting systems
* = symptomatic

Among the variables related to human cases, the following were considered to be most important: the number of human cases and deaths, the beginning and the end date as well as the location of the outbreak and the type of the outbreak. Of the variables related to the food vehicle, the identification of the food vehicle, its origin, the evidence for incriminating the food vehicle, the places of food preparation and consumption, the origin of the contamination of the food vehicle, the factors contributing to its contamination as well as the results of the laboratory analysis of the food vehicle were considered to be the most relevant variables (Table 3).

Evaluation of the reporting system

The web-based reporting system for foodborne outbreaks developed by EFSA in 2003 and used until 2007 provided a table form to capture information on the total number of outbreaks per year, the number of human cases and deaths in these outbreaks, the causative agents of the outbreaks, the foodstuffs implicated as vehicles of the causative agents, the location of exposure of the human cases to the contaminated food vehicle and the contributory factors, i.e. the factors contributing to the contamination of the incriminated food. In addition, a text form was provided by the web-based reporting system to capture information on the national system in place for identification, epidemiological investigations and reporting of foodborne outbreaks, the types of outbreaks covered by the system, the national evaluation of the reported outbreaks with respect to relevance of the different causative agents, food categories and the agent/food category combinations and an evaluation of the severity and clinical picture of the human cases, the description of single outbreaks of special interest and on the control measures or other actions taken to improve the situation. All data fields except those for the information on the 'causative agent', which could be chosen from a pick-list with variable degrees of detail (speciation and subtyping information), were free text fields.

By August 2006, of the 26 countries eligible for reporting (25 EU Member States plus Norway), 24 countries (23 EU MS and Norway) submitted data on foodborne outbreaks which had occurred in 2005, resulting in 92% participation rate. The table form was used by 21 EU MS and Norway (n=22, 85%), whereas the text form was submitted by 19 EU MS and Norway (n=20, 77%). In all, 972 table-form reports were submitted, the majority of which contained information on individual outbreaks (n=826, 85%), whereas in less than one-fifth of the reports (n=146, 15%) information on more than one outbreak was aggregated.

Information on the causative agent at the genus-level was provided in all aggregated and all individual reports. All reports also contained information about the type of outbreak ("general outbreak" or "family outbreak"). The number of human cases was given in 99% of individual and 96% of aggregated outbreak reports. Data on the vehicle of the outbreak, that is the foodstuff incriminated for causing the outbreak, was available in 92% of the individual outbreak reports but only in 78% of the aggregated outbreak reports. Information on the "location of exposure" was

Table 2

Information on factors regarding the incriminated food item collected by the national reporting systems (n=27)

Variable	Systems n	Systems %
Place of consumption	26	96
Place of food preparation	23	85
Factors contributing to contamination of the food	23	85
Factors contributing to survival/multiplication of the agent in the food	21	78
Origin of contamination of the food	20	74
Origin of incriminated food (i.e. imported or national product)	18	67
Method of food preparation	15	56
Method of food processing	14	52
Reasons not allowing identification of origin of food contamination	12	44

n = number of national reporting systems collecting data on the variable
% = percentage of all reporting systems

Table 3

Prioritisation of objectives for the Community foodborne outbreak reporting system by the respondents (n=35)

Objective	High priority n	High priority %	Low priority n	Low priority %	No need n	No need %	Other n	Other %	Score
Gather information on and monitor the vehicles of food-borne outbreaks	31	88	3	9	1	3	0	0	65
Gather information on and monitor the agents causing food-borne outbreaks	31	88	3	9	1	3	0	0	65
Gather information on and monitor risk factors* for food-borne outbreaks	30	85	4	12	1	3	0	0	64
Monitor trends in agents causing food-borne outbreaks	28	79	6	18	1	3	0	0	62
Identify new agents causing food-borne outbreaks	29	82	3	9	2	6	1	3	61
Provide comparable data on food-borne outbreaks	26	74	8	23	1	3	0	0	60
Evaluate the impact of control measures taken	25	71	9	26	1	3	0	0	59
Identify new vehicles of food-borne outbreaks	24	69	9	26	2	6	0	0	57
Monitor trends in vehicles involved in food-borne outbreaks	22	62	12	35	1	3	0	0	56
Gather information on and monitor special risk groups of consumers for food-borne outbreaks	19	56	13	35	3	9	0	0	51

n= number of respondents assigning the objective to the priority level; %= percentage of all respondents; score= number of respondents assigning the objective to a given priority level multiplied with the rank of the priority level ("High priority" = 2, "Low priority" = 1, "No need" = 0); * risk factors = host factors and factors contributing to the contamination of the incriminated food given in 95% of the individual and 75% of the aggregated outbreak reports respectively (Table 4).

Most countries provided some information on their reporting systems, on the evaluation of the national situation regarding foodborne outbreaks as well as a description of the types of outbreaks covered by their reporting systems (between 80 to 90% completeness) through the text form.

The quality of the submitted data was assessed separately for data submitted through the table form and for data submitted through the text form. In the individual outbreak reports submitted through the table form, most of the data provided on the type of evidence and the location of exposure were submitted under the corresponding field of the table (96 and 90% of the relevant entries). In contrast, only 70% of the information on the food vehicle of the outbreak was submitted under the corresponding field ("Source"), and only slightly more than half of the information on contributing factors was reported under the field "Contributing factors" (Table 5).

For all 146 aggregated outbreak records submitted in the table form, whenever information on the incriminated food vehicle was given it was entered in the corresponding field of the table. The same applies to the information submitted on the location of exposure. In contrast, only 76% of the information on contributing factors was provided under the corresponding field.

A large proportion of the 20 completed text forms contained the requested information on the authorities and institutions involved in investigating and reporting foodborne outbreaks, on their roles and responsibilities, and on mandatory and voluntary activities in this field (75 to 80%). Approximately half of the text forms contained the requested information on the relevance of the agents involved in the reported foodborne outbreaks (60%) and the types of outbreaks covered by the system (50%). Information on the trends observed in the number of outbreaks and cases, the relevance of the places of food production and preparation as well as the evaluation of the severity and clinical pictures of the human cases was provided less frequently (range 5-35% completeness).

Table 4

Completeness of outbreak records submitted in the table forms (n=972)

	All outbreak records (n=972)		Aggregated outbreak records (n=146)		Individual outbreak records (n=826)	
Data field	No. non-blank fields	Completeness (%)	No. non-blank fields	Completeness (%)	No. non-blank fields	Completeness (%)
Causative agent	972	100	146	100	826	100
Causative agent species	797	82	120	82	677	82
Causative agent Subtype	304	31	49	34	255	31
Outbreak type	971	100	146	100	824	100
Number of persons ill	959	99	140	96	819	99
Number of persons who died	653	67	112	77	541	65
Number of persons in hospital	732	75	112	77	620	75
Source*	878	90	114	78	764	92
Level of confirmation of source*	784	81	79	54	689	83
Type of evidence	576	59	63	43	513	62
Location of exposure	897	92	110	75	787	95
Contributing factors	382	39	21	14	361	44
Comment	80	8	24	16	56	7
Footnote	212	22	16	11	196	24

*source = implicated food

Table 5

Distribution of information of individual outbreak records (n=826) in corresponding and non-corresponding fields of the table form

Thematic area	Requested information provided in corresponding field		Requested information provided in other field		Requested information provided total
	n	%	n	%	n
Source*	712	70	303	30	1015
Location of exposure	713	90	80	10	793
Type of evidence	279	96	11	4	290
Contributing factors	146	55	119	45	265

*source = implicated food

Sensitivity analysis

The sensitivity of the reporting system was assessed for a subset of countries (Denmark, France, Germany, Ireland, Norway, Sweden, United Kingdom) by comparing individual records of outbreaks occurring in 2005 and reported to EFSA (EFSA dataset, n=229) with reports on individual foodborne outbreaks occurring in 2005 and published in national bulletins, annual reports or peer-reviewed journals (national dataset, n=124). Information on the causative agent and the type of outbreak was complete in both data sets. There was little difference between the levels of completeness for the number of human cases (97% in the EFSA and 96% in the national data set), the place of exposure (85% and 84% respectively), the incriminated food (54% and 63% respectively), the type of evidence (40% and 37% respectively) and the food processing information (26% and 28% respectively). Information on the number of deaths and the number of hospitalisations was more complete in the EFSA data set with 43% and 34% respectively as compared to the national data set with a completeness of 8% each. The national data set was more complete than the EFSA data set with regards to subtyping information (85% as compared to 65%), species information for food of animal origin (23% as compared to 18%), and contributing factors (15% as compared to 8%).

Thirty-nine identical outbreaks were identified in the EFSA and the national dataset through matching of the information on the parameters "reporting country", "causative agent", "number of cases" and "food vehicle". For most of these outbreaks the level of detail of the information provided on the species for food of animal origin, on the place of exposure and on processing of incriminated food was the same in the EFSA and the national dataset (92%, 87% and 82% respectively). 50% of the reports contained information on the type of evidence only in the EFSA data set, whereas for 37% of the outbreak records information on contributing factors was reported exclusively in the national data set [4].

Developing the reporting system further

Taking into consideration the results of the survey and the evaluation of the current system, a proposal for a new foodborne outbreak reporting system was drafted. This proposal was subsequently accepted by the participating countries through the EFSA Task Force on Zoooses Data Collection and the ECDC Advisory Forum. The system has been used in May 2008 to report data from 2007.

Its main objectives are to assess the trends in the number and size of foodborne outbreaks and the share of outbreaks related to different causative agents [5]. It should also collect information on the severity of disease in the human cases involved; the importance of different food categories as vehicles of foodborne outbreaks and the risk factors contributing to the occurrence of foodborne outbreaks. The scope of the new system has been set to cover foodborne outbreaks caused not only by zoonotic agents, but by any virus, bacterium, algae, fungus, parasite, and their products, such as toxins and biological amines (e.g. histamine) as well as foodborne outbreaks where the causative agent remains unknown. Foodborne outbreaks caused by chemical agents are, however, not covered at this stage. Outbreaks caused by ingestion of drinking water are also considered foodborne since drinking water is defined as food in Regulation 178/2002/EC. An additional table form capturing the number of foodborne outbreaks, distinguishing between possible and verified foodborne outbreaks, has been introduced. Possible foodborne outbreaks are outbreaks compatible with descriptive epidemiological evidence alone including also outbreaks where the causative agent is unknown. Their number should be reported by causative agent, including the option "unknown agent", in the new table. The original table form should only be used to report details on verified outbreaks, i.e. outbreaks compatible with descriptive epidemiological evidence and laboratory detection of the causative agent in implicated food or analytical epidemiological evidence or both. The table has been modified by adding pick-lists for most of the variables. In addition to selecting the implicated foodstuff category from a pick-list, a free text field can be used to define the foodstuff in more detail, e.g. to submit details on the animal or plant species the food was made from and the treatment of the food. Two new variables have been added to the table to collect information on the place where the contamination or the mishandling of the implicated food occurred ("place of origin of problem") and on the origin of foodstuff, e.g. whether the implicated foodstuff originated from the domestic market, from intra-community trade or was imported from outside the EU. A comprehensive manual containing definitions of all terms included in the pick-lists as well as examples has been prepared to facilitate reporting. In April 2008 EFSA, in collaboration with ECDC, organised a training course in the new system for relevant officers of the countries participating in reporting.

Discussion and conclusion

The responses received through the questionnaire survey show that the vast majority of the national foodborne outbreak reporting systems in the EU provide the information that is requested pursuant Article 9 (1) of the Zoonoses Directive (Annex IV, E) [2]. In fact, many of the national systems collect complementary information on a number of variables. It is particularly encouraging to note that already many national systems collect detailed data on the incriminated food vehicles, on the causative agents, on the human cases and on the contributing factors. This could contribute to reaching the objectives of the Community reporting system considered most important by the survey respondents, i.e. the identification and the monitoring of the vehicles, the causative agent and the risk factors involved in foodborne outbreaks. However, when interpreting the results of the questionnaire on information needs it should be taken into account that the responses might have been influenced at least partially by the countries' capacities to collect the respective data. For example, the fact that collection of data on the method of food processing or on the origin of the food contamination ranked relatively low on the priority list is probably related to difficulties in tracing back the origin of foodstuffs and establishing this kind of information.

The evaluation of the Community reporting system revealed that its acceptability in general was very high as reflected by the high rates of participation and submission as well as the high proportion of completeness of most data fields. Also the sensitivity assessment indicated that the Community systems captured almost all foodborne outbreaks reported in national reports or peer-reviewed journals and it collected sufficient detail of information available on most variables. With regard to subtyping information, which was less frequently captured by the EFSA system, it might be useful to consider whether reporting this type of data could be further simplified in the EFSA system. However, the results of the sensitivity assessment should be interpreted with some caution as the countries included in this evaluation have well established foodborne outbreak reporting systems and might not be representative for all EU Member States.

The fact that a considerable fraction of the requested information is not reported in the corresponding data field of the current system makes the analysis of the reported data difficult. This is further aggravated by the occurrence of spelling variations (e.g. "restaurant" versus "restarant") and synonyms (e.g. "kindergarten" vs. "day care center") inherent in text data reporting. While spelling variations and the use of synonyms can be obviated by introducing list fields instead of free-text fields, the frequent misplacement of information in another than the intended field also indicates that clearer instructions and further explanations might be needed on the kind of information requested in each field of the reporting form.

The Community foodborne outbreak reporting system was developed further taking into account the existing structures, variables and pick-lists of Member States' national systems as well as other reporting systems, such as the WHO surveillance system for control of foodborne infections and intoxications in Europe [6].

This should not only harmonise, but also make the reporting of foodborne outbreaks easier for Member States. Another move into this direction is the introduction of the possibility to upload national data in bulk using XML-format. Through the differentiation between possible and verified foodborne outbreaks in the new system the quantity of data to be reported should be less, as detailed information is only requested for verified outbreaks. The data on verified outbreaks will be used to characterise the nature of foodborne outbreaks in the Community and to carry out in depth-analysis of the involved food vehicle-causative agent combinations. At the same time, the system should allow to study the overall extent and impact of foodborne outbreaks in the Community by additionally capturing the number of possible outbreaks. Detailed definitions for all variables have been established. They have been agreed upon by experts from both veterinary and public health. The introduction of pick-lists for most variables will facilitate both the manual inputting of data as well as the uploading of data in bulk. Together with the introduction of definitions, this will lead to a harmonisation of reporting and ease the analysis of the reported data. Possible problems with misunderstanding the meaning of the values in the pick-list should be minimal because of the provision of comprehensive explanations and examples in the reporting manual and extensive online-user-guidance provided by the web-based system.

Because of its higher level of integration with other existing reporting systems, its increased simplicity and, therefore, higher acceptability the new Community foodborne outbreak reporting system is expected to yield better quality data on foodborne outbreaks. This will hopefully increase the availability of relevant data for food safety risk assessment critical for identifying priorities for control and monitoring programmes.

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