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Travellers returning with measles from Thailand to Finland, April 2012: infection control measures

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Countries with no autochthonous measles run the risk of the virus being imported by travellers and transmitted to unprotected citizens. In April 2012, two travellers from Finland and one from Estonia were diagnosed with measles after returning from Phuket, Thailand. They were contagious on their return flights and subsequently exposed several individuals, prompting extensive infection control measures. Two secondary cases were detected: one child who had received one vaccine dose and another who was fully vaccinated.

In April 2012, three people who had travelled from Finland contracted measles after their return from Phuket, Thailand. We describe here the measures taken for these three cases and the identification of secondary cases.

Case 1 was an Estonian woman in her early 30s living in Finland, who may have received one dose of measles vaccine during childhood. She flew to Phuket on 23 March and her symptoms started on 3 April. When flying back to Helsinki on 6 April, she had both a fever and a rash. The next day she was referred from a healthcare centre to Hospital A. It was only the following day (8 April), after she had been admitted to infectious diseases Hospital B, that measles was suspected. The diagnosis was confirmed (positive serum IgM and detection of measles virus RNA by PCR from oral fluid, throat and urine samples) on 12 April.

Case 2, an unvaccinated Finnish woman in her early 40s, had no history of measles. She took the same flight to Phuket as Case 1 and developed fever on the morning of her return flight on 6 April. She was admitted to Hospital C on 8 April. The next day, measles was suspected and she was transferred to infectious diseases Hospital B. The diagnosis was confirmed (positive serum IgM and detection of measles virus RNA by PCR from oral fluid, throat and urine samples) on 12 April.

Case 3, an Estonian woman in her early 30s, may have received one dose of measles vaccine during childhood. Having arrived in Phuket on 19 March, she developed fever and began coughing and sneezing on the day of her flight home, 2 April. She then travelled by ferry from Helsinki to Tallinn, Estonia, and soon returned to her work as schoolteacher. Her symptoms persisted and she was first examined by a family doctor on 5 April, then admitted to Hospital D and subsequently to infectious diseases Hospital E, where finally measles was suspected. The diagnosis was confirmed (positive serum IgM) seven days later, on 13 April.

It is noteworthy that all three cases stayed at different hotels in Thailand and had no known contact with one another besides the flights taken by Cases 1 and 2.

Background

Outbreaks of measles still occur repeatedly in Europe in many areas where vaccination coverage is not sufficiently high [1,2]. In countries with high coverage, such as Finland (>95%) [3], the small proportion of unprotected citizens (unvaccinated or not having had the disease) are virtually at no risk of contracting the virus, as it has ceased to circulate among the population. However, such individuals may get infected when travelling and, after their return, transmit the virus to others who are also unprotected, as has been seen in Finland (Table 1). Thus not even high vaccination coverage will prevent local clusters of the disease [3]. Once measles is suspected, infection control is urgently needed to prevent its potential spread. Notably, however, the suspicion of measles can be delayed in countries with no autochthonous measles, since clinicians may no longer recognise the disease.

Control measures

The national recommendations advise all travellers to check their vaccination status, including that for mumps-measles-rubella (MMR) vaccine before travel,

yet, our experience is that short-term travellers to Thailand, like our patients, seldom seek pre-travel advice.

In all three cases, once measles was suspected, the patients were immediately placed in isolation with airborne precautions. Doctors responsible for communicable disease control in Finland and Estonia, and the National Institute for Health and Welfare in Finland were also informed about the cases. All three cases had all been contagious on their return flights, and had afterwards, in their home country, been in contact with several individuals. Upon confirmation of the diagnoses of Cases 1 and 2 on 12 April, the doctor in Hospital B, having first interviewed the patients, alerted Hospitals A and C, as well as the communicable diseases doctor responsible for all health centres, to begin contact tracing (Table 2).

After receiving the flight number of Cases 1 and 2 on 12 April, the National Institute for Health and Welfare contacted the travel agency responsible for the trip. The travel agency provided the telephone numbers and email addressed for all passengers. SMS (text) messages were sent on the same day alerting them to read their emails specifying the symptoms of measles. Should any passenger develop any of the symptoms, they were advised to call their health centres for guidance. Post-exposure prophylaxis (immunoglobulin or MMR vaccination) was no longer an issue as a week had passed since the flight.

On 12 April, the Finnish Early Warning and Response System (EWRS) team was notified about Case 3 in Estonia by the Estonian EWRS team, who also provided the flight number and all passengers were informed the same way as described above. A decision was made not to undertake contact tracing among ferry passengers.

In Finland, the National Institute for Health and Welfare sent emails to all healthcare districts informing them about the cases as well as the national guidelines [4] on 13 April. In the two countries, a total of 772 persons were reached and 21 of them, mainly health professionals, were given post-exposure prophylaxis (Table 2). Contact tracing revealed two secondary cases. The first, a 9-year-old pupil at the school in Estonia where Case 3 worked, had previously received one dose of MMR vaccine. The second, a fully vaccinated 13-year-old in Finland, had taken the same flights as Cases 1 and 2. The child's symptoms started on 16 April, implying that he could have contracted the disease already in Thailand.

The virus isolated from Cases 1 and 2 belonged to genotype D8, known to be circulating in Thailand (MeaNS, http://www.who-measles.org).

TABLE 1

Measles cases in Finland, January 1996–May 2012 (n=47)

Year	Number of cases[a]	Country visited by index cases
1996	0	–
1997	0	–
1998	1	Brazil
1999	0	–
2000	2	Sweden (n=1), India (n=1)
2001	1	Papua New Guinea
2002	0	–
2003	0	–
2004	0	–
2005	1	Italy
2006	0	–
2007	0	–
2008	5	Thailand (n=1), Switzerland (n=1), England (n=3)
2009	2	Iraq (n=1), Italy(n=1)
2010	5	Senegal (n=1), Italy (n=1)
2011	27	France (n=3), Latvia/Sweden (n=1)
2012	3	Thailand (n=2)

[a] Index cases and secondary cases are included.

Discussion

In Finland, circulation of measles virus ceased in the mid-1990s [3]. All reported cases since 1996 have been laboratory confirmed, the source of infection has been traced and infection control measures taken [3] (Table 1). Despite the relatively large number of travellers to and from Finland (annual average of 5 million and 6.4 million, respectively) [3], measles cases have been rare, contracted mostly in other European countries (Table 1). In Thailand, despite the national immunisation programme, measles outbreaks still occur occasionally in both rural and urban areas [5]. Over 100,000 flights are taken by Finns to Thailand every year [6], yet only one measles case has been reported among travellers returning from Thailand, in 2008, before the cases reported here (Table 1). It is noteworthy that on 14 May 2012, measles was reported also in a Russian traveller having recently returned from Thailand [7].

In the present instance, the diagnostic tests were delayed due to the Easter holidays and a misunderstanding at the laboratory. Even if further transmission from the index cases had been blocked by isolating the patients, the time window for post-exposure prophylaxis proved too long for many contacts. Despite this, those who had not had measles or two doses of MMR vaccine were, of course, advised to ensure that their vaccination series were completed. Finns born between 1960 and 1975 have not always received the vaccines or had the disease; many healthcare workers

TABLE 2

Persons born after 1960[a] reached through contact tracing and post-exposure prophylaxis administered, Finland and Estonia, April 2012 (n=772)

Site and group of individuals traced	Number of persons traced	Number of persons vaccinated with two doses of MMR vaccine or measles verified /number of persons with information available	Post-exposure prophylaxis administered	
			Immunoglobulin	MMR vaccine
Aircraft 1	290[b,c]	NA	0	0
Aircraft 2	290[b,c]	NA	0	0
Case 1 (in Finland)				
Hospital A				
Emergency unit patients	2	2/2	0	0
Radiology staff/patients	4	3/3	0	0
Healthcare staff	14	13/13	0	0
Healthcare centre staff/patients	16	8/12[c]	1	1
Hospital B				
Healthcare staff	2	1/2	0	1
Family and friends	4	2/4[c]	0	0
Total	**42**	**29/36[c]**	**1**	**2**
Case 2 (in Finland)				
Hospital C				
Emergency unit patients	12	9/12	3	0
Patients on same ward	1	0/1	0	1
Radiology staff/patients	5	5/5	0	0
Visitors	2	1/2	1	0
Healthcare staff	31	18/31	0	13
Family and friends	6	6/6	0	0
Total	**57**	**39/57**	**4**	**14**
Case 3 (in Estonia)				
Family practice				
Personnel	2	1/2[c]	0	0
Other patients	3	2/3[c]	0	0
Ambulance staff	3	2/3[c]	0	0
Hospital D				
Healthcare staff	5	2/5[c]	0	0
Hospital E				
Healthcare staff	17	10/17[c]	0	0
Family and friends	3	2/3[c]	0	0
Colleagues at school	10	2/10[c]	0	0
Pupils at school[d]	50	49/50[c]	0	0
Total	**93**	**70/93[c]**	**0**	**0**
Grand total	**772**	**138/186[c]**	**5**	**16**

MMR: mumps-measles-rubella; NA: not available.

[a] In Finland, most individuals born before 1960 have had measles and are therefore considered immune.

[b] Includes passengers of all ages on board the plane.

[c] Those considered susceptible, but only reached more than 72 hours after the exposure were (i) informed about the symptoms of measles, (ii) instructed to call their healthcare centre, should any symptoms occur, and (iii) instructed to ensure that their MMR vaccinations were complete.

[d] Children aged 7–9 years vaccinated with one dose of MMR vaccine (second dose planned at the age of 13 years).

may belong to this age group, which is reflected in the numbers of unprotected individuals among healthcare staff in Hospital C (Table 2).

It should be noted that one of the secondary cases was a child who had received two vaccine doses. It appears that the child had seroconverted earlier, since measles IgG antibody level was relatively high on 20 April, i.e. only four days after the onset of the symptoms. Measles has, although rarely, been described in vaccinees with earlier documented seroconversion [8-13].

On this occasion, the process of reaching the flight passengers ran exceptionally smoothly. The travel agency readily provided both telephone numbers and email addresses for all passengers on the two charter flights. Emails and SMS messages were swiftly arranged. Information about individuals with infectious measles on an aircraft usually arrives too late, and passenger lists are not easily available, as was the case with travellers who had travelled on the same ferry as Case 3. If so, a press release is the most efficient means of contacting people.

Travellers returning infected may occasionally signal ongoing outbreaks in their destination countries. International networks alert their members about cases in the various countries. When reporting our cases on the European Network for Tropical Medicine and Travel Health (TropNet) member site, we learned that no outbreaks of measles had been identified in Thailand as yet (Dr Jiri Beran, personal communication, 26 April 2012). While both flights with the measles cases on board were destined for Finland, presumably flying mostly Finnish passengers, information on the flight carrying Case 3 relied entirely on the Estonian EWRS team reporting their case. This accentuates the importance of accurate surveillance and international networking as central tools for infection control.

References

1. Moss WJ, Griffin DE. Measles. Lancet. 2012;379(9811):153-64.
2. Muscat M, Bang H, Wohlfahrt J, Glismann S, Mølbak K; EUVAC.NET Group. Measles in Europe: an epidemiological assessment. Lancet. 2009;373(9661):383-9.
3. Davidkin I, Kontio M, Paunio M, Peltola H. MMR vaccination and disease elimination: the Finnish experience. Expert Rev Vaccines. 2010;9(9):1045-53.
4. National Institute for Health and Welfare (THL). Toimenpideohje torjuntatoimista tuhkarokkotapauksen yhteydessä. [Guidelines for infection control measures against measles]. Helsinki: THL; 7 June 2011. Finnish. Available from: http://www.thl.fi/thl-client/pdfs/0adda5d0-d43f-4ed6-ad4c-e0d9a330da14
5. Tharmaphornpilas P, Yoocharean P, Rasdjarmrearnsook AO, Theamboonlers A, Poovorawan Y. Seroprevalence of antibodies to measles, mumps, and rubella among Thai population: evaluation of measles/MMR immunization programme. J Health Popul Nutr. 2009:27(1):80-6.
6. Official Statistics of Finland (OSF): Finnish travel. Helsinki: Statistics Finland. [Acccessed 28 May 2012]. Available from: http://www.stat.fi/til/smat/index_en.html
7. ProMED-mail. [Measles (outbreak - 47 cases) - Russia (Udmurtia) (4)]. Archive Number 20120515.142692. 15 May 2012. Russian. Available from: http://www.promedmail.org/direct.php?id=20120515.142692
8. Gustafson TL, Lievens AW, Brunell PA, Moellenberg RG, Buttery CM, Sehulster LM. Measles outbreak in a fully immunized secondary-school population. N Engl J Med. 1987;316(13):771–4.
9. Mathias RG, Meekison WG, Arcand TA, Schechter MT. The role of secondary vaccine failures in measles outbreaks. Am J Public Health. 1989;79(4):475-8.
10. Hirose M, Hidaka Y, Miyazaki C, Ueda K, Yoshikawa H. Five cases of measles secondary vaccine failure with confirmed seroconversion after live measles vaccination. Scand J Infect Dis. 1997;29(2):187-90.
11. Reyes MA, de Borrero MF, Roa J, Bergonzoli G, Saravia NG. Measles vaccine failure after documented seroconversion. Pediatr Infect Dis J. 1987;6(9):848-51.
12. Smith FR, Curran AS, Raciti KA, Black FL. Reported measles in persons immunologically primed by prior vaccination. J Pediatr. 1982;101(3):391-3.
13. Kremer JR, Schneider F, Muller CP. Waning antibodies in measles and rubella vaccinees—a longitudinal study. Vaccine. 2006;24(14):2594-601.

2012 outbreak of acute haemorrhagic conjunctivitis in Indian Ocean Islands: identification of Coxsackievirus A24 in a returned traveller

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In May 2012, a Coxsackievirus A24 haemorrhagic conjunctivitis was diagnosed in Marseille, France, in a traveller returning from the Comoros Islands. This case allowed identification of the cause of an ongoing outbreak of haemorrhagic conjunctivitis in Indian Ocean Islands, illustrating that returning travellers may serve as sentinels for infectious diseases outbreaks in tropical areas where laboratory investigation is limited.

Background

An outbreak of acute haemorrhagic conjunctivitis occurred from February to May 2012 in Mayotte, a French island in the South-West Indian Ocean, where it accounted for 15% to 45% of consultations in primary care structures [1,2]. Over 1,000 cases had been reported, based on clinical criteria by the end of March 2012 [1,2]. The outbreak had now spread to the Union of the Comoros*, but the current number of cases is unknown. The disease, called *Matso-matso* by the local population (*Matso* meaning 'the eyes' in the local language) is recognised there to be highly contagious, and the intensity of the outbreak is illustrated by the number of people wearing black sun glasses on the streets [3]. Acute haemorrhagic conjunctivitis outbreaks have also been described in local newspapers in Madagascar [4] and Mauritius [5]. The aetiology of this outbreak was not known by 25 May 2012.

Case description

We report here a case of haemorrhagic conjunctivitis in a traveller returning from the Union of the Comoros* to Marseille, France. The patient was in his 20s, born in France, and presented on 14 May 2012 with a diagnosis of lower limb erysipelas secondary to super-infection of arthropod bites, and a bilateral haemorrhagic purulent conjunctivitis that started four days earlier. He had been staying from 15 April to 14 May 2012 in the south of the island of Ngazidja (Grande Comore) with the purpose of visiting friends and relatives. He reported that five close members of his family, as well as other inhabitants of the same village, were affected by bilateral conjunctivitis during his stay. In our hospital, the erysipela was successfully treated by antibiotic therapy (amoxicillin/clavulanic acid, 3 g per day) and the patient was discharged on 18 May, with improvement of conjunctivitis symptoms using nonantibiotic eye lubricant drops. No secondary conjuntivitis cases were observed among his relatives in France.

Virological analysis

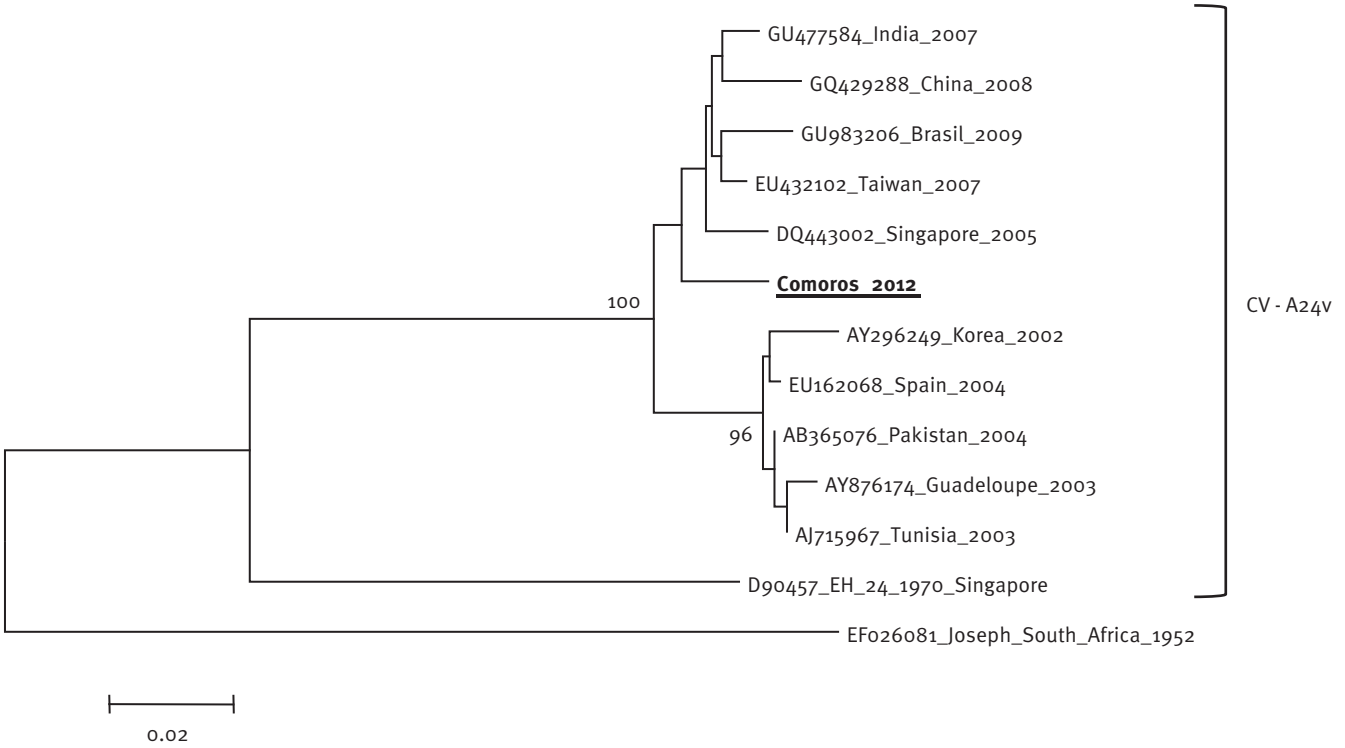
Conjunctival swabs were sent to the laboratory of virology at the Marseille University Hospital. A real-time PCR assay detecting human enteroviruses was performed as described previously [6] and enterovirus RNA was detected (cycle threshold: n=34). Virus isolation was attempted using Vero, BGM and MA104 cells and is still in progress, and molecular typing (nested RT-PCR) was performed as previously described [7], using the nucleic acid extract of the initial sample. The nested PCR allowed amplification of a 327 bp partial sequence of the VP1 gene. Direct sequencing of the amplicon provided the definitive identification of coxsackievirus A24 variant (CV-A24v) via BLAST analysis [8]. The partial sequence obtained was aligned for comparison with other homologous CV-A24v virus sequences using Clustal X [9]. Phylogenetic analysis was performed using neighbour-joining method (Jukes–Cantor algorithm) in MEGA 5.0 software [10] and confirmed that the virus detected is CV-A24v (Figure). The sequence has been deposited in GenBank under accession number JX196594**.

Discussion

Coxsackievirus A24, enterovirus 70 and some adenovirus serotypes are the main pathogens responsible for acute haemorrhagic conjunctivitis, which occurs as

Figure

Phylogenetic analysis of coxsackievirus A24v patient isolate, based on a partial VP1 nucleotide sequence, Marseille, May 2012



The phylogenetic tree was based on nucleotide sequences in the VP1 gene. It was constructed using the neighbour-joining method. Bootstrap values >70% are indicated (1,000 replicates). The virus called Comoros_2012 is that detected in this study (complete sequence available on request)

seasonal outbreaks, particularly in tropical and subtropical areas [11]. Epidemics were first described in Ghana in 1969 [12], and CV-A24v was first isolated during an epidemic in Singapore in 1970 [13]. In the past four decades, CV-A24v was recognised as the major pathogen responsible for acute haemorrhagic conjunctivitis epidemics [14-16] and has recently been responsible for outbreaks in Brazil, China, Cuba, Sudan and Uganda [17-20]. Human-to-human direct transmission is usually through lachrymal secretions or respiratory contamination [21]. Indirect transmission through contaminated ophthalmological device or swimming pool waters has also been described [22].

In Marseille, the population originating from Comoros has been estimated at 50,000 to 70,000 inhabitants, although the precise number is difficult to assess [23]. Therefore, Marseille University Hospital Insitute for Infectious and Tropical Diseases can be used as a sentinel to document outbreaks occurring in south-west Indian Ocean Islands [24].

This new outbreak of acute haemorrhagic conjunctivitis in Comoros, but also in Madagascar and Mauritius raises concerns of local spread in Indian Oceans Islands, as well as of new cases imported from there to Europe. The possibility of an outbreak in Europe and specifically France, given the high contagiousness of the disease cannot be excluded. Strict adherence to hygiene rules is essential for the control of the epidemics. No member of our hospital team has been contaminated in the context of the case described here.

We demonstrate one more time that travellers may act as sentinels to document infectious disease outbreaks in tropical areas where laboratory tools are limited.

* Authors' correction:

The name of Comoros was corrected on 13 June 2012 at the request of the authors.

* * Addendum

The sequence has been deposited in GenBank under accession number JX196594 [added on 2 July 2012].

References

1. Institut de Veille Sanitaire. Epidémie de conjonctivite à Mayotte. [Conjunctivitis epidemic in Mayotte]. Point épidémiologique no. 15, CIRE Océan indien; 22 Mar 2012. French. Available from: http://www.ars.ocean-indien.sante.fr/fileadmin/OceanIndien/Internet/Veille_et_securite_sanitaire/Gestion_de_crise_sanitaire/CIRE/Dossiers_thematiques/Conjonctivite/220312_15_conjonctivite_MAY.pdf
2. Institut de Veille Sanitaire. Epidemie de conjonctivites à Mayotte. [Conjunctivitis epidemic in Mayotte]. Point épidémiologique no. 18, CIRE Océan indien; 6 Apr 2012. French. Available from: http://www.invs.sante.fr/content/download/34667/170451/version/7/file/pe_conjonctivites_mayotte_060412.pdf
3. Attention, "Matso-matso" est de retour à Ndzuwani! [Attention, "Matso-matso" is back in Ndzuwani!]. Al-watwan no. 1942; 25 Apr 2012. French. Available from: http://www.alwatwan.net/pdf/25042012.pdf
4. Andrianarisoa V. La conjonctivite sévit à Mahajanga. [Conjunctivitis is rife in Mahajanga]. L'express de Madagascar no.5235; 30 May 2012. French. Availabale from: http://www.lexpressmada.com/epidemie-madagascar/33417-la-conjonctivite-sevit-a-mahajanga.html
5. Conjunctivitis: highly contagious. Le défi Mediagroup - Mauritius News Information Portal. 22 Mar 2012. Available from: http://www.defimedia.info/news-sunday/health/item/8525-conjunctivitis--highly-contagious.html
6. Tan CY, Ninove L, Gaudart J, Nougairede A, Zandotti C, Thirion-Perrier L, et al. A retrospective overview of enterovirus infection diagnosis and molecular epidemiology in the public hospitals of Marseille, France (1985-2005). PLoS One. 2011;6(3):e18022.
7. Nix WA, Oberste MS, Pallansch MA. Sensitive, seminested PCR amplification of VP1 sequences for direct identification of all enterovirus serotypes from original clinical specimens. J Clin Microbiol. 2006;44(8):2698-704.
8. Altschul SF, Gish W, Miller W, Myers EW, Lipman DJ. Basic local alignment search tool. J Mol Biol. 1990;215(3):403-10.
9. Larkin MA, Blackshields G, Brown NP, Chenna R, McGettigan PA, McWilliam H, et al. Clustal W and Clustal X version 2.0. Bioinformatics. 2007;23(21):2947-8.
10. Tamura K, Peterson D, Peterson N, Stecher G, Nei M, Kumar S. MEGA5: molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods. Mol Biol Evol. 2011;28(10):2731-9.
11. Chang CH, Sheu MM, Lin KH, Chen CW. Hemorrhagic viral keratoconjunctivitis in Taiwan caused by adenovirus types 19 and 37: applicability of polymerase chain reaction-restriction fragment length polymorphism in detecting adenovirus genotypes. Cornea. 2001;20(3):295-300.
12. Chatteriee S, Quarcoopome CO, Apenteng A. Unusual type of epidemic conjunctivitis in Ghana. Br J Ophthalmol. 1970;54(9):628-30.
13. Lim KH, Yin-Murphy M. An epidemic of conjunctivitis in Singapore in 1970. Singapore Med J. 1971;12(5):247-9.
14. Cabrerizo M, Echevarria JE, Otero A, Lucas P, Trallero G. Molecular characterization of a coxsackievirus A24 variant that caused an outbreak of acute haemorrhagic conjunctivitis in Spain, 2004. J Clin Virol. 2008;43(3):323-7.
15. Triki H, Rezig D, Bahri O, Ben Ayed N, Ben Yahia A, Sadraoui A, et al. Molecular characterisation of a coxsackievirus A24 that caused an outbreak of acute haemorrhagic conjunctivitis, Tunisia 2003. Clin Microbiol Infect. 2007;13(2):176-82.
16. Wu D, Ke CW, Mo YL, Sun LM, Li H, Chen QX, et al. Multiple outbreaks of acute hemorrhagic conjunctivitis due to a variant of coxsackievirus A24: Guangdong, China, 2007. J Med Virol. 2008;80(10):1762-8.
17. De W, Huanying Z, Hui L, Corina M, Xue G, Leng L, et al. Phylogenetic and molecular characterization of coxsackievirus A24 variant isolates from a 2010 acute hemorrhagic conjunctivitis outbreak in Guangdong, China. Virol J. 2012;9:41.
18. Fonseca MC, Sarmiento L, Resik S, Pereda N, Rodríguez H, Kourí V, et al. Isolation of Coxsackievirus A24 variant from patients with hemorrhagic conjunctivitis in Cuba, 2008-2009. J Clin Virol. 2012;53(1):77-81.
19. Tavares FN, Campos Rde M, Burlandy FM, Fontella R, de Melo MM, da Costa EV, et al. Molecular characterization and phylogenetic study of coxsackievirus A24v causing outbreaks of acute hemorrhagic conjunctivitis (AHC) in Brazil. PLoS One. 2011;6(8):e23206.
20. Centers for Disease Control and Prevention (CDC). Notes from the field: acute hemorrhagic conjunctivitis outbreaks caused by coxsackievirus A24v Uganda and southern Sudan, 2010. MMWR Morb Mortal Wkly Rep. 2010;59(32):1024.
21. Yin-Murphy M, Goh KT, Phoon MC, Yao J, Baharuddin-Ishak. A recent epidemic of acute hemorrhagic conjunctivitis. Am J Ophthalmol. 1993;116(2):212-7.
22. Chomel JJ, Gaudin OG, Nejmi S, Sohier R. Conjonctivite aiguë hémorragique épidémique due à un nouvel enterovirus. [Acute epidemic haemorrhagic conjunctivitis due to an enterovirus]. Nouv Presse Med. 1973;2(26):1781–3. French.
23. Parola P, Pradines B, Simon F, Carlotti MP, Minodier P, Ranjeva MP, et al. Antimalarial drug susceptibility and point mutations associated with drug resistance in 248 Plasmodium falciparum isolates imported from Comoros to Marseille, France in 2004-2006. Am J Trop Med Hyg. 2007;77(3):431-7.
24. Parola P, de Lamballerie X, Jourdan J, Rovery C, Vaillant V, Minodier P, et al. Novel chikungunya virus variant in travelers returning from Indian Ocean islands. Emerg Infect Dis. 2006;12(10):1493-9.

Psittacosis outbreak in Tayside, Scotland, December 2011 to February 2012

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A Tayside outbreak of psittacosis December 2011–February 2012 involved three confirmed and one probable cases. Confirmed cases were indistinguishable by sequencing of polymerase chain reaction (PCR) products. The epidemiological pattern suggested person-to-person spread as illness onset dates were consistent with the incubation period and no single common exposure could explain the infections. In particular the only common exposure for a healthcare worker case is overlap in place and time with the symptomatic index case.

Outbreak description

During February 2012, Tayside's Health Protection Team was notified of five cases of pneumonia. These illnesses affected four family members and one healthcare worker (HCW) who had tended the index case. Four of these developed severe symptoms, two requiring intensive care unit (ICU) admission. These four had complement fixation tests (CFT) suggesting infection with a *Chlamydophila* species. Although speciation was not possible at this stage, the time interval of one to 22 days between the symptom onset of consecutive cases, suggested person-to-person spread. An outbreak of *Chlamydophila pneumoniae* infection therefore seemed likely. Pending identification, the outbreak response proceeded on this basis. By mid-February *C. psittaci* was confirmed by polymerase chain reaction (PCR).

Background

Psittacosis is a systemic infectious disease caused by *Chlamydophila psittaci*. Usual features include fever, malaise, unproductive cough, headache and atypical pneumonia. The incubation period is one to four weeks [1]. Since its first description in 1879 [2], epidemics occurred during the next century. Where identified, the source of such outbreaks and infections was zoonotic, and predominantly avian but not necessarily psittacine. For example, large outbreaks occurred among poultry workers [3]. Subsequently, these have become rare, as avicultural hygiene has intensified. In Scotland, up to 10 sporadic cases per year were notified (no outbreaks) in the past 10 years (Table) [4]. We have found no case described in the literature where person-to-person spread has accounted for cases of psittacosis, although person-to-person transmission has evidently been suggested but not proven [5].

Outbreak investigation and results

During a series of outbreak management team (OMT) meetings, results were assessed and further investigation directed. Awareness raising among Tayside medical practitioners aimed to increase case ascertainment. The investigation progressed on three fronts: epidemiological, microbiological and environmental.

TABLE

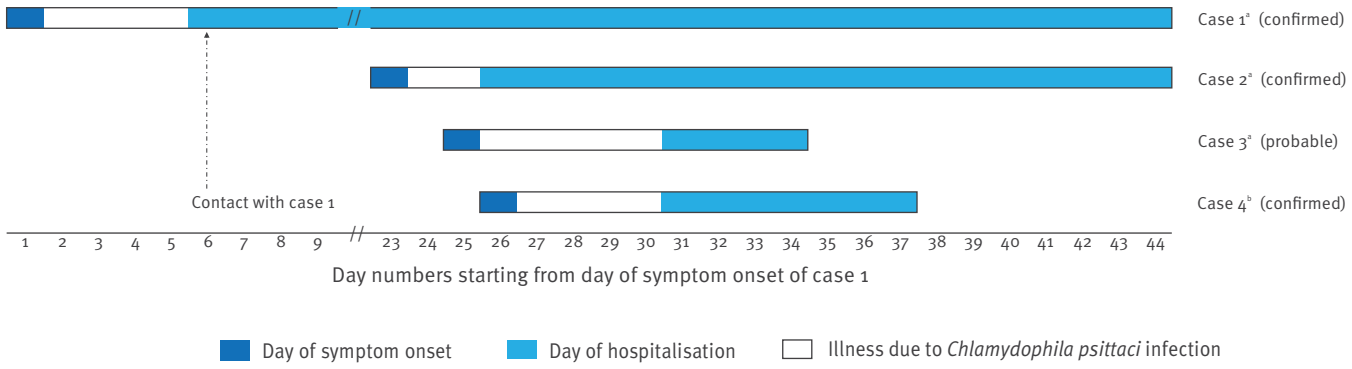
Total number of cases of *Chlamydophila psittaci* infections notified annually, Scotland, 2001–2011 (n=27)

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of cases	2	10	1	4	0	0	1	1	2	5	1

Source: Health Protection Scotland (HPS) (Lynda Browning, personal communication, 23 May 2012) [4].

Figure

Time of symptom onset and clinical course of probable and confirmed cases, psittacosis outbreak in Tayside, Scotland, December 2011–February 2012 (n=4)



[a] Cases 1, 2 and 3 were part of an extended family and had extensive and frequent contact with eachother.
[b] Case 4, a healthcare worker, had contact with case 1 on the sixth day of case 1's illness, as indicated by an arrow.

Epidemiological investigation

A modified Centers for Disease Control and Prevention (CDC) case definition [6] was agreed. To be considered, cases must have compatible clinical illness. All notified cases were interviewed about their illness, contacts and relevant possible exposures. Confirmed cases had either *Chlamydophila* species detected in respiratory secretions (by culture or PCR) or a fourfold or greater increase in antibody (IgG or IgM) to *Chlamydophila* species (to a reciprocal titre of 32 between paired acute- and convalescent-phase serum specimens taken at least two weeks apart) by CFT. Cases which were epidemiologically linked to a confirmed case were considered probable, given an antibody (IgG or IgM) titre of 256 or greater, and possible given one of 32 to 128 (all by CFT in a serum specimen taken after symptom onset).

Applying this, by 22 February 2012, the outbreak involved three confirmed, one probable and two possible cases, with the index case having had onset of illness in late December 2011. The figure describes the time of onset and clinical course for confirmed and probable cases. These comprised three female and one male with an age range of 41 to 65 years.
A further two possible cases were identified: a family member with mild respiratory illness and an unrelated patient from the same ICU as the index case.

Microbiological investigation

Initial investigations used CFT performed according to standard methods using antigen obtained from Launch Diagnostics, Longfield, Kent, United Kingdom (UK) [7]. The CFT antigen is a chlamydia group specific antigen. The test detects total complement fixing antibody: both IgG and IgM.

Real-time PCR was performed using in house assay on respiratory samples which were initially used for investigations for respiratory viruses. The screen for *Chlamydophila* species was an assay targeted to 16S ribosomal sequences. Any positive sample was further investigated by specific real-time PCR to *C. psittaci* or *C. pneumoniae* targeting a different region of the 16S ribosomal sequence. This enabled determination of which *Chlamydophila* species was involved in a case.

Of the confirmed cases, two showed a rising CFT titre, one a static raised titre. All were PCR positive. Sequence analysis of the outer membrane protein A (ompA) gene showed 100% similarity between these *C. psittaci* strains. The probable case had a static CFT titre above 256 and was PCR negative. Possible cases had static titres of 64 to128 and were PCR negative.

Environmental investigation

Extensive cartographical and field searches were made for possible avian sources of infection. These were directed by information gleaned from interviews with cases. Workplaces and residences of cases were plotted on an Ordnance Survey map. Cases 2 and 3 lived together a kilometre from case 1. Case 4 resided a further ten kilometres west. Although not within any of the cases' respective place of residence, two pigeon coops and a cage of small birds were found in the neighbourhood of where cases 1, 2 and 3 lived. None were within 500 m of case 1, but as these could be considered a plausible source, faecal samples were taken for PCR analysis.

The index case's pet dog was reported to have rolled in the remains of a dead bird in December. Also, this

case's workplace was reported to be affected by a large number of gulls. Searches in both areas revealed insufficient sample material. On veterinary recommendation (included in the OMT), a PCR analysis of a pooled canine faecal sample was done, using an unpublished method, developed at the UK Animal Health and Veterinary Laboratories Agency, Weybridge. This PCR detects the presence of *C. psittaci* and *C. abortus* and was negative.

No environmental source of any *Chlamydophila* species was revealed by environmental investigations. This is not unusual [8].

Control measures

Since the source of the infection was thought to be a pathogen which was not readily transmissible from person-to-person, standard infection control measures were recommended for those HCWs and other people in contact with cases.

Discussion and conclusion

The main issue in this outbreak is the picture of person-to-person spread. The authors can find no description of this in psittacosis. Incubation ranging from one to four weeks implies up to 21 days between shortest and longest. The longest gap between onset of confirmed cases was 25 days. While the cases amongst the extended family might be explained by a putative persistent source to which family members were sequentially exposed (e.g. a geographical, not temporal, point source), case 4 (the HCW) cannot.

Since cases 1 to 3 were members of an extended family and had extensive and frequent contact with each other (especially over the winter holiday season) it was not possible to retrospectively identify particularly significant 'mutual exposure events'. However, shared exposures between case 4 and the others were sought. The only spatial-temporal overlap was with case 1 and occurred during the admission of case 1 to the ward where case 4 worked. Case 4's duties included personal care (not invasive procedures). Conceivably, case 4 may have been exposed while caring for case 1 who required intensive medical support and investigation. Since it was not possible to explore direct contact between the two cases, it is uncertain what such exposure might be.

It is difficult to explain all cases in this outbreak by exposure to a common non-human source. While inconclusive, features consistent with person-person spread are demonstrated. In our view, clinicians and public health specialists should therefore keep an open mind to the possibility of person to person spread of psittacosis despite the received opinion that this generally does not occur.

References

1. Heymann DL, editor. Control of communicable diseases manual. 19th ed. Washington DC: American Public Health Association; 2008.
2. Vanrompay D, Ducatelle R, Haesebrouck F. Chlamydia psittaci infections: a review with emphasis on avian chlamydiosis. Vet Microbiol. 1995;45(2-3):93-119.
3. Gaede W, Reckling KF, Dresenkamp B, Kenklies S, Schubert E, Noack U, et al. *Chlamydophila* psittaci infections in humans during an outbreak of psittacosis from poultry in Germany. Zoonoses Public Health. 2008;55(4):184-8.
4. Health Protection Scotland (HPS). Chlamydia psittaci, Scotland, Annual Total as at 28 June 2011. Glasgow: HPS. [Accessed 24 May 2012]. Available from: http://www.documents.hps.scot.nhs.uk/giz/10-year-tables/psittaci.pdf
5. Centers for Disease Control and Prevention. Compendium of measures to control Chlamydia psittaci infection among humans (psittacosis) and pet birds (avian chlamydiosis), 2000 and Compendium of animal rabies prevention and control, 2000. National Association of State Public Health Veterinarians, Inc. MMWR Recomm Rep. 2000;49(RR-8):3-17.
6. Centers for Disease Control and Prevention. Compendium of measures to control Chlamydia psittaci infection among humans (psittacosis) and pet birds (avian chlamydiosis), 2000 and Compendium of animal rabies prevention and control, 2000. National Association of State Public Health Veterinarians, Inc. MMWR Recomm Rep. 2000;49(No. RR-8):5.
7. Grist NR, Ross CA, Bell EJ. Diagnostic Methods in Clinical Virology. Second edition. Blackwell Scientific Publications: Oxford; 1974.
8. Mulder MM, Heddema ER, Pannekoek Y, Faridpooya K, Oud ME, Schilder-Tol E, et al. No evidence for an association of ocular adnexal lymphoma with Chlamydia psittaci in a cohort of patients from the Netherlands. Leuk Res. 2006;30(10):1305-7.

Mandatory and recommended vaccination in the EU, Iceland and Norway: results of the VENICE 2010 survey on the ways of implementing national vaccination programmes

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This report provides an updated overview of recommended and mandatory vaccinations in the European Union (EU), Iceland and Norway, considering the differences in vaccine programme implementation between countries. In 2010, the Vaccine European New Integrated Collaboration Effort (VENICE) network, conducted a survey among the VENICE project gatekeepers to learn more about how national vaccination programmes are implemented, whether recommended or mandatory. Information was collected from all 27 EU Member States, Iceland and Norway. In total 15 countries do not have any mandatory vaccinations; the remaining 14 have at least one mandatory vaccination included in their programme. Vaccination against polio is mandatory for both children and adults in 12 countries; diphtheria and tetanus vaccination in 11 countries and hepatitis B vaccination in 10 countries. For eight of the 15 vaccines considered, some countries have a mixed strategy of recommended and mandatory vaccinations. Mandatory vaccination may be considered as a way of improving compliance to vaccination programmes. However, compliance with many programmes in Europe is high, using only recommendations. More information about the diversity in vaccine offer at European level may help countries to adapt vaccination strategies based on the experience of other countries. However, any proposal on vaccine strategies should be developed taking into consideration the local context habits.

Introduction

Vaccinations are one of the most important tools of primary prevention. All countries in the European Union (EU) have a long tradition of implementing vaccination programmes. The level of control over diphtheria, *Haemophilus influenzae* type b (Hib) infections, hepatitis B, polio and tetanus is excellent in many countries [1]. The burden of measles, mumps, rubella, and pertussis decreased dramatically over the last decades, but there is still room for improvement in those programmes in many EU countries [2]. Strong efforts are being made to accelerate the implementation of newly introduced vaccines against pneumococcal, meningococcal and human papillomavirus disease.

In the presence of such a large variety of vaccines on offer, the way vaccination programmes are organised differs considerably between countries. The vaccines included in the programme, the type of vaccine used, the total number of doses administered, and the timing of the vaccinations vary. Vaccines can also be offered in many different ways: usually, the vaccines included in the routine (childhood) vaccination programme are paid for by the national healthcare system, whereas in some countries other vaccines need to be paid for up front by the recipient [3]. There are also large differences in whether vaccinations included in the national programmes are recommended or mandatory. Mandatory vaccination can be enforced by legislation, even though the term 'mandatory' has to be interpreted differently in different countries.

The Vaccine European New Integrated Collaboration Effort (VENICE) is a European network of experts working in the field of immunisation. All 27 EU Member States plus Iceland and Norway participate in VENICE. In each country a so called gatekeeper for VENICE is identified among the national experts in vaccine-preventable diseases [4]. In 2007, VENICE conducted a survey on immunisation programmes. The survey also included some questions whether vaccinations were recommended or mandatory. Of the 28 participating countries, 10 reported mandatory vaccinations for

different vaccines in their national immunisation programmes [3].

In the meantime, vaccination programmes have changed. New vaccines have been added to the immunisation programmes [5] and legislation about recommended and mandatory vaccinations may have changed. Therefore, the aim of this article is to provide an updated overview of recommended and mandatory vaccinations in the EU countries, Iceland and Norway, considering the differences in the modality of vaccine programme implementation between countries.

Methods

The national VENICE gatekeepers from the participating countries, the 27 EU countries plus Iceland and Norway, were sent a survey by email and asked to fill it out. The survey addressed the question whether the different childhood vaccinations were recommended (i.e. voluntary) or mandatory. A definition of 'recommended' and 'mandatory' was provided in order to avoid misinterpretation. The following definitions were used:

- Recommended: vaccination included in the national immunisation programme for all or some specific groups independent of being funded or not.

- Mandatory: a vaccination that every child must receive by law without the possibility for the parent to choose to accept the uptake or not, independent of whether a legal or economical implication exists for the refusal.

The gatekeepers were asked to provide information about childhood vaccinations against: diphtheria, Hib, hepatitis A, hepatitis B, human papillomavirus (HPV), influenza, invasive disease caused by N*eisseria meningitidis* serogroup C, invasive pneumococcal disease, measles-mumps-rubella, (MMR), pertussis, polio, rotavirus, tetanus, tuberculosis (with Bacillus Calmette-Guérin, BCG) and varicella. The reply options were (i) recommended (for all or for people at risk), (ii) mandatory (for all or for people at risk), or (iii) absence of recommendation. Data were collected in November 2010. Data from all countries were sent to the VENICE gatekeepers who were asked to validate them in April 2011.

Results

In total 28 of the 29 participating countries responded to the survey. For four countries (Estonia, Germany, Luxembourg and the Netherlands) additional information was found on the websites of the respective national public health institutes, which allowed the table for all 29 countries to be completed [6-10]. Data were validated from 19 countries. The results per country can be found in table 1.

The results according to vaccine are shown in Table 2.

All 29 countries include vaccination against diphtheria, hepatitis B, Hib, influenza, MMR, pertussis, polio and tetanus in their programme. In total 28 countries include vaccination against invasive pneumococcal disease in their recommendation or legislation, some countries only for children and others also for adults or risk groups. Most other vaccinations (against hepatitis A, HPV, invasive disease caused by *Neisseria meningitidis* serogroup C, tuberculosis (with BCG) and varicella) are considered by at least 20 of the participating countries. An exception is observed for rotavirus vaccination, which is only included in the national immunisation programme for nine of the 29 countries.
In total 15 countries do not have any mandatory vaccinations; the remaining 14 countries have at least one mandatory vaccination included in their programme. Vaccination against polio is mandatory for all children in 12 countries; diphtheria and tetanus vaccination is mandatory in 11 countries, and hepatitis B vaccination in 10 countries. For eight of the 15 vaccines considered here, some countries have a mixed strategy of recommended and mandatory vaccinations. Usually this means that the vaccination is recommended for the whole population, but that it is mandatory for some risk groups.

Discussion

Mandatory vaccination may be considered as a way of improving the compliance to vaccination programmes. However, many programmes in Europe are effective even though voluntary, just with recommendations.

In the vaccination field, legal consequences can be very different: they can be very strong – including pecuniary penalties, difficulty to attend public schools, or even penal consequences for the parents – or can be much milder with the possibility of choosing to 'opt-out'. Moreover, the enforcement varies in practice. It is possible that in some cases penalties are only theoretical and never applied. This information was not collected in this survey because it is difficult to evaluate the national context and differences could exist in different regions of each country.
Opinions on recommended or mandatory vaccinations are divided, because several ethical issues are related to the subject [11,12]. Furthermore, at first sight there seems to be no striking difference in vaccination coverage between countries that only recommend certain vaccinations and countries that oblige them [1,12], although from studies it is known that making influenza vaccination mandatory for healthcare workers can increase the vaccination coverage rates in this particular group [13]. On the other hand, in 2008 the Veneto region in Italy, with a population of five million, abolished all mandatory vaccination, and the coverage trend was carefully monitored. A vaccine coverage evaluation, performed in the region during 2010 for the 2008 birth cohort (the first cohort concerned by the change), revealed a slight decline of immunisation coverage rates for all the vaccinations mandatory prior to 2008 (diphtheria, hepatitis B, polio, tetanus) though levels remain well above the objective of 95%, as aimed for by the Italian National Immunisation Plan

TABLE 1

Modality of implementation of childhood vaccination programme by country, the European Union countries, Iceland and Norway, 2010 (n=29)

A Country	Diphtheria	*Haemophilus influenzae* type B	Hepatitis A	Hepatitis B	Human papillomavirus[a]	Influenza	Invasive disease caused by *Neisseria meningitides* group C
Austria	RA	RA	RR	RA	R	RR	RA
Belgium	RA	RA	RR	MR/RA[b])	R	RR	RA
Bulgaria	MA	MA	RR	MA	R	RR	A
Cyprus	RA	RA	RR	RA	A	RR	RA
Czech Republic	MA	MA	MR	MA	R	RR	RR
Denmark	RA	RA	RR	RR	R	RR	RR
Estonia [6]	RA	RA	RA[e]	RA	R[e]	RA[e]	RR[e]
Finland	RA	RA	RR	RR	A	RA	A
France	MA/MR/RA[f]	RA	RR	MR/RA[b]	R	RR	RA
Germany [7]	RA	RA	RR	RA	R	RR	RA
Greece	MA	RA	RA	MA[h]	R	RR	RA
Hungary	MA	MA	MR	MA	A	RR	A
Iceland	RA	RA	RR	RR	A	RR	RA
Ireland	RA	RA	RR	RA	R	RR	RA
Italy	MA[j]	RA	A[l]	MA	R	RR	RA/RR[k]
Latvia	MA	MA	RR	MA	MA	RR	RR
Lithuania	RA	RA	RR	RA	A	RR	RR
Luxembourg [8]	RA	RA	RR	RA	R	RR	RA
Malta	MA	RA	RR	RA	A	RA	A
The Netherlands [9]	RA	RA	RR	RR	R	RR	RA
Norway	RA	RA	A	RR	R	RR	A
Poland	MA	MA	RR	MA	R	RR	RR
Portugal	RA/MR	RA	A	RA	R	RR	RA
Romania	MA	MA	RR	MA	R	RR	A
Slovakia	MA	MA	MR/RR[p]	MA	R	MR/RR[o]	RR
Slovenia	MA	MA	RR	MA	R	RR	RR
Spain	RA	RA	RR/RA[k]	RA	R	RR	RA
Sweden	RA	RA	A	RR	R	RR	A
United Kingdom	RA	RA	RR	RR	R	RR	RA

A: absence of recommendation, MA: mandatory for all; MR: mandatory for people at risk; R: recommended; RA: recommended for all; RR: recommended for people at risk.

[b] Mandatory for healthcare workers.

[d] RA: conjugated vaccine to children younger than two years of age.
RR: polysaccharide vaccine to older persons.

[e] Not included in the national immunisation programme, but recommended by the Ministry of Social Affairs [10].

[f] MA: children up to 18 months of age.
MR: healthcare workers.
RA: bolder than 13 years of age.

[g] MA: children up to 13 years of age.
MR: healthcare workers.
RA: older than 13 years of age.

[h] No penalty exists for non-compliance.

[j] One of 20 regions does not have any mandatory vaccination as of 2008.

[k] Regional variability.

[m] Rubella: mandatory for girls by the age of 14.

TABLE 1

Modality of implementation of childhood vaccination programme by country, the European Union countries, Iceland and Norway, 2010 (n=29)

B Country	Invasive pneumococcal disease	Measles-mumps-rubella	Pertussis	Polio	Rotavirus	Tetanus	Tuberculosis (with Bacillus Calmette-Guérin)	Varicella
Austria	RA	RA	RA	RA	RA	RA	A	RR
Belgium	RA	RA	RA	MA	RA	RA	A	RR
Bulgaria	MA/RA[c]	MA	MA	MA	RA	MA	MA	A
Cyprus	RA	RA	RA	RA	A	RA	RR	RA/RR
Czech Republic	MR	MA	MA	MA	A	MA	MR	RR
Denmark	RA/RR[d]	RA	RA	RA	A	RA	A	RR
Estonia [6]	RR[e]	RA	RA	RA	RR[e]	RA	RA	RR[e]
Finland	RA	RA	RA	RA	RA	RA	RR	A
France	RA	RA	RA	MA/MR/RA[g]	A	MA/MR/RA[f]	MR/RR[b]	RR
Germany [7]	RA	RA	RA	RA	A	RA	A	RA
Greece	RA	RA	RA	MA[h]	A	MA	RA	RA
Hungary	RA	MA	MA	MA	A	MA	MA	A
Iceland	RR/RA[i]	RA	RA	RA	A	RA	A	RR
Ireland	RA	RA	RA	RA	A	RA	RA	RR
Italy	RA/RR[k]	RA	RA	MA	A	MA	RR	RA/RR[k]
Latvia	MA	MA	MA	MA	MA[i]	MA	MA	MA
Lithuania	RR	RA	RA	RA	A	RA	RA	RR
Luxembourg [8]	RA	RA	RA	RA	RA	RA	RR	RA
Malta	RR[n]	RA[m]	RA	MA	A	MA	RA	RR
The Netherlands [9]	RA	RA	RA	RA	A	RA	RR	A
Norway	RA	RA	RA	RA	A	RA	RR	A
Poland	MR	MA	MA	MA	RA	MA	MA	RR
Portugal	RR	RA	RA	RA	A	RA/MR	RA	A
Romania	A	MA	MA	MA	A	MA	MA	A
Slovakia	MA	MA	MA	MA	A	MA	MA	A
Slovenia	RR	MA	MA	MA	RA	MA	RR	RR
Spain	RA/RR[k]	RA	RA	RA	A	RA	A[l]	RA/RR[k]
Sweden	RA	RA	RA	RA	A	RA	RR	A
United Kingdom	RA	RA	RA	RA	A	RA	RR	RR

A: absence of recommendation, MA: mandatory for all; MR: mandatory for people at risk; R: recommended; RA: recommended for all; RR: recommended for people at risk.

[a] Mostly recommended for girls 10-17 years of age.
[b] Mandatory for healthcare workers.
[c] RA: children born prior to 2010 and younger than five years of age.
[d] RA: conjugated vaccine to children younger than two years of age.
RR: polysaccharide vaccine to older persons.
[e] Not included in the national immunisation programme, but recommended by the Ministry of Social Affairs [10].
[i] RA: from 2011.
[k] Regional variability.
[l] RA: only in one region.
[n] RR: for children under two years of age.
[o] MR: social care facilities.
RR: children six months to 12 years of age, elderly, for some diagnoses, for some professions.
[p] MR: direct contact with infectious person, some professions.
RR: chronic liver disease, children two years of age living in bad conditions, some professions.

TABLE 2

Modality of implementation of childhood vaccination programme by vaccine in the European Union countries, Iceland and Norway, 2010

Vaccination	Considering vaccination	Recommended (RA or RR)	Mandatory (MA or MR)	Mixed
Diphtheria	29	16	11	2
Haemophilus influenzae type B	29	21	8	0
Hepatitis A	25	22	2	1
Hepatitis B	29	17	10	2
Human papillomavirus	23	22	1	0
Influenza	29	28	NM	1
Invasive disease caused by *Neisseria meningitides* serogroup C	22	22	NM	0
Invasive pneumococcal disease	28	23	4	1
Measles-mumps-rubella	29	21	8	0
Polio	29	16	12	1
Pertussis	29	21	8	0
Rotavirus	9	8	1	0
Tetanus	29	16	11	2
Tuberculosis (with Bacillus Calmette-Guérin)	23	15	7	1
Varicella	20	19	1	0

MA: mandatory for all; MR: mandatory for people at risk; NM: not mandatory in any of the countries in the study; RA: recommended for all; RR: recommended for people at risk.

[14]. The evaluation of this experience, over time, may lead to legislative changes at national level [15]. Further research and reports of experiences are needed to see if a relation exists between voluntary or mandatory vaccination programmes, and vaccination coverage.

In countries where both recommended and mandatory vaccinations are part of the national immunisation plan (i.e. France, Greece, Italy, Malta) vaccines against pertussis, measles-containing vaccines and vaccines against Hib are recommended, not mandatory, and the coverage is still very high [16]. Thus the label 'mandatory' is not the only driver behind achieving a high vaccination coverage in these countries and many other factors can play a role such as the use of combined vaccines, prices for the recipient, kind of offer, information and promotional campaigns. The results of our survey show that there are several differences among participating countries. Immunisation strategies range from only voluntary vaccinations in the programme to an almost completely mandatory vaccination programme, and everything in between. The reasons behind such wide differences are probably both historical and cultural rather than evidence-based. Differences in costs for recipients and the kind of vaccination offer, whether active or passive, also exist. These aspects have been explored through other, disease-specific, surveys performed by VENICE [4].

The issue of mandatory versus recommended vaccinations has been widely discussed in Europe. The situation might change over the coming years following the example of countries where high coverage is achieved, taking advantage of communication strategies and the awareness of the citizen for public health problems and relative solutions.

In conclusion, a national healthcare system should promote and actively offer those vaccines that have been proven to be safe, effective, and with a positive public health impact. In a world where people trust health authorities, more compliance with national recommendations can be established. This would not only benefit the health of citizens, but also support the overall effectiveness of a vaccination programme through the herd immunity effect.

However, communication of the risks and of advantages and disadvantages resulting from large immunisation programmes is a very sensitive issue and any decision about a proposal for vaccine strategies should be elaborated in agreement with tradition and cultural habits.

In this quick survey a recommended vaccination was considered to be a 'vaccine included in the national immunisation plan but not mandatory'. Some countries may not have a unique official document for recommended vaccinations and therefore it may not be straightforward to categorise a vaccine as recommended or not. A different use of the term 'recommended' could also explain some differences to the

programme reported on the World Health Organization website [17].

Meanwhile more information about the diversity in vaccine offer at European level may help countries to adapt vaccination strategies based on the experience of other countries. In this way it is possible also to improve the vaccine offer to the citizen and to increase the awareness of European citizens about the importance of vaccination for public health and the underlying evidence for the strategies chosen. The availability of comparable vaccination coverage data for all the Member States will help this process.

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References

1. World Health Organization (WHO) European Region. Centralized information system for infectious diseases (CISID). [Accessed: 9 Nov 2010]. Available from: http://data.euro.who.int/cisid/?TabID=67.
2. Muscat M, Bang H, Wohlfahrt J, Glismann S, Mølbak K; EUVAC.NET Group. Measles in Europe: an epidemiological assessment. Lancet. 2009. 373(9661):383-9.
3. Vaccine European New Integrated Collaboration Effort (VENICE). Report on First survey of Immunisation Programs in Europe. 2007. Available from: http://venice.cineca.org/Report_II_WP3.pdf
4. Vaccine European New Integrated Collaboration Effort. [Internet]. Vaccine European New Integrated Collaboration Effort. (VENICE). Nov 2010. Available from: http://venice.cineca.org/
5. King, LA, Lévy-Bruhl D, O'Flanagan D, Bacci S, Lopalco PL, Kudjawu Y, et al. Introduction of human papillomavirus (HPV) vaccination into national immunisation schedules in Europe: Results of the VENICE 2007 survey. Euro Surveill. 2008;13(33). Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=18954
6. Terviseamet. Estonian Health Board. [Internet]. [The national immunisation programme]. [Accessed: 2 Jan 2012]. Estonian. Available from: http://vaktsineeri.ee/riiklik-immuniseerimiskava.html
7. Robert Koch Institute (RKI). Aktuelle Empfehlungen der STIKO. [Accessed: 5 Nov 2010] German. Available from: http://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2011/Ausgaben/30_11.pdf?__blob=publicationFile.
8. Rijksinstituut voor Volksgezondheid en Milieu (RIVM). Rijksvaccinatieprogramma (RVP). Vaccinatieschema. [Accessed: 5 Nov 2010]. Dutch. Available from http://www.rivm.nl/rvp/rijks_vp/vac_schema/.
9. Ministère de la Santé Luxembourg. Vaccinations recommandées. [Accessed: 9 Nov 2010]. French. Available from: http://www.sante.public.lu/fr/rester-bonne-sante/vaccinations/vaccination-recommandations/index.html.
10. Terviseamet. Estonian Health Board. [Internet]. [Vaccination recommendations] [Accessed: 5 Nov 2010] Estonian. Available from: http://www.vaktsineeri.ee/vaktsineerimissoovitused.html
11. Isaacs D, Kilham H, Leask J, Tobin B. Ethical issues in immunisation. Vaccine. 2009;27(5):615-8.
12. Salmon DA, Teret SP, MacIntyre CR, Salisbury D, Burgess MA, Halsey NA. Compulsory vaccination and conscientious or philosophical exemptions: past, present, and future. Lancet. 2006;367(9508):436-42.
13. Babcock HM, Gemeinhart N, Jones M, Dunagan WC, Woeltje KF. Mandatory influenza vaccination of healthcare workers: translating policy to practice. Clin Infect Dis. 2010;50(4):459-64.
14. Veneto Region. [Report on immunization activities, birth cohorts 2008 and 2007, and monitoring of mandatory vaccination abolition, birth cohorts 2009 and 2010]. 2011. Accessed 1 Feb 2012 [Italian]. Available from: http://www.regione.veneto.it/NR/rdonlyres/89018626-6853-447A-868A-348EA8857EF6/0/MonitoraggiodelsistemavaccinaledelVenetoal31marzo2011.pdf
15. Molinelli A, Bonsignore A, Querci A, Icardi G, Martini M, Durando P. Towards the suspension of compulsory vaccination in Italy: balancing between public health priorities and medico-legal and juridical aspects. J Prev Med Hyg. 2009;50(3):135-40.
16. World Health Organization (WHO). Vaccine-preventable diseases: monitoring system 2011 global summary. WHO-UNICEF estimates of DTP3 coverage.[Accessed: 1 Feb 2012]. Available from: http://www.who.int/immunization_monitoring/en/globalsummary/timeseries/tswucoveragedtp3.htm
17. World Health Organization (WHO). Vaccine Preventable Diseases Monitoring System Immunization schedules by antigen, selection centre. Available from: http://apps.who.int/immunization_monitoring/en/globalsummary/ScheduleSelect.cfm