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Cohort study of a campylobacteriosis outbreak associated with chicken liver parfait, United Kingdom, June 2010

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In an outbreak of 24 cases of gastroenteritis among guests at a wedding reception, 13 cases had confirmed *Campylobacter* infection. In a cohort study, univariate analysis revealed a strong association with consumption of chicken liver parfait: risk ratio (RR): 30.08, 95% confidence interval (CI): 4.34-208.44, p<0.001, which remained after adjustment for potential confounders in a multivariable model: RR=27.8, 95% CI=3.9-199.7, p=0.001. These analyses strongly support the hypothesis that this outbreak was caused by the consumption of chicken liver parfait.

Background

Campylobacteriosis is an acute bacterial enteric disease, caused by infection with *Campylobacter*. Common symptoms include diarrhoea, abdominal pain, malaise, fever, nausea, and/or vomiting [1] and may persist for a week or even longer [2]. Onset is usually between two and five days after exposure, but may be up to 10 days. The infectious dose required to cause *Campylobacter* illness is estimated to be as low as 500 organisms [3]. *Campylobacter* infection continues to be the most commonly reported cause of foodborne illness in England and Wales, with 57,772 laboratory reports of *Campylobacter* cases received by the Health Protection Agency (HPA) in 2009 [4].

Despite the high incidence of this disease, the HPA received only 114 reports of foodborne *Campylobacter* outbreaks between 1992 and 2009, of which 25 (22%) were recorded as being linked to consumption of poultry liver dishes [5]. Chicken liver foods carry a high risk of *Campylobacter* infection as the bacteria can infect both the external and internal tissue of chicken livers [6], and may remain in chicken liver if insufficiently cooked [7]. The association between poultry liver dishes and outbreaks of *Campylobacter* infection has been illustrated by two recently published studies from Scotland [8,9].

On 5 July 2010, a suspected outbreak of campylobacteriosis was reported to the North East Health Protection Unit (HPU) by Environmental Health Officers from Northumberland County Council. Reports of illness were received from guests at a wedding held at a luxury hotel in Northumberland on 25 June 2010. One guest was hospitalised with *Campylobacter* infection following the event. In total, 13 guests who ate at the event submitted samples that tested positive for *Campylobacter*. The event consisted of a wedding breakfast (afternoon meal) and an evening buffet.

At the first Outbreak Control Team meeting on 7 July 2010, the decision was made to undertake an analytical study. Reports of illness were only received from guests who had attended the wedding breakfast, and accordingly the study was carried out on this group.

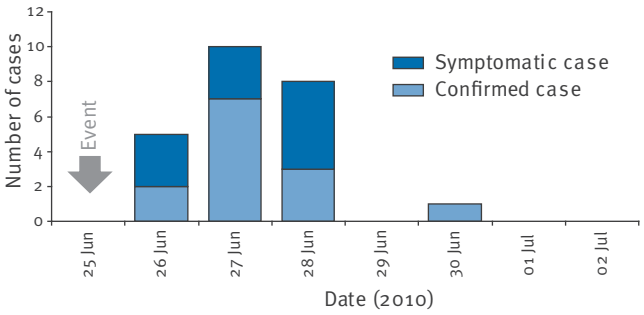
Method

Study design and cohort

A retrospective cohort study was used. The cohort was defined as persons who had eaten the wedding breakfast at the luxury hotel on 25 June 2010 (n=67). Contact details for these 67 guests were obtained from the event organiser. The evening buffet was excluded because no cases were reported in guests attending only the evening buffet. All reported cases attended the wedding breakfast (three of them attended only the wedding breakfast).

Figure

Cases of campylobacteriosis by onset of symptoms, United Kingdom, June 2010 (n=24)



Data collection

Of the 67 guests listed by the event organiser, 65 were posted a questionnaire with a covering letter and a stamped and addressed return envelope. The remaining two guests, resident outside the United Kingdom (UK), were sent an electronic copy of the covering letter and questionnaire via email in order to maintain the timeliness of the investigation. One week after the first posting, a follow-up letter was sent to those guests whose questionnaires were still to be received.

Case definition

Cases were defined as persons who attended the wedding at the hotel on 25 June 2010, who reported an illness with diarrhoea or vomiting, with or without other gastrointestinal symptoms, and with an onset of illness between 26 June 2010 and 5 July 2010. Guests with illness onset dates less than one day or greater than 10 days after the event were included as non-cases.

Response rate

Of the 67 persons on the guest list, two were found to be infants who did not eat the wedding breakfast and were excluded from the study, giving a potential cohort size of 65. Completed questionnaires were received from 60 of 65 remaining guests (92%).

Questionnaire content

The questionnaire contained questions regarding personal details, illness information, travel history, other illness in the household, food and drink consumed at the meal, in addition to other questions relating to the participant's stay at the hotel. The menu for the wedding breakfast was obtained from the hotel; details from this menu were used to inform the content of the questionnaire.

Statistical analyses

Data were double-entered using EpiData v3.1 (EpiData Association) and then verified and analysed using STATA 10.1 (StataCorp). The association between exposure variables and illness was examined using univariate, stratified methods (using Mantel-Haenszel risk ratios and the Woolf test for homogeneity) and multivariable methods (logistic and binary regression).

Table 1

Demographic and symptomatic characteristics of study participants, campylobacteriosis outbreak, United Kingdom, June 2010 (n=60)

	Cases		Non-cases		Total
Gender					
Males	13	54%	16	44%	**29**
Females	11	46%	20	56%	**31**
Total	**24**	**100%**	**36**	**100%**	**60**
Age					
Mean age	40.86		41.22		**41.08**
<20	0	0%	2	6%	**2**
20-65	22	92%	32	89%	**54**
65+	2	8%	2	6%	**4**
Total	**24**	**100%**	**36**	**101%**[b]	**60**
Symptom					
Diarrhoea	24	100%	1[a]	3%	**25**
Abdominal pain	23	96%	2	6%	**25**
Fever	22	92%	2	6%	**24**
Nausea	20	83%	2	6%	**22**
Other symptom	9	38%	0	0%	**9**
Vomiting	8	33%	1[a]	3%	**9**
Bloody diarrhoea	5	21%	0	0%	**5**

[a] A person who was ill with diarrhoea and vomiting on the day of the meal and was therefore not included as a case.

[b] Due to rounding.

Results

Descriptive epidemiology

Of the 60 individuals included in the study, 24 fitted the case definition. Of these 24, 13 received laboratory confirmation of *Campylobacter* infection. Illness onset dates for cases ranged from 26 to 30 June 2010 (Figure 1). The incubation period ranged from one to five days (mean = 2.25 days). The symptoms experienced by cases are shown in Table 1; duration of symptoms ranged from 1 to 18 days. A mean duration of symptoms cannot be calculated as 13 of 24 cases were still experiencing symptoms when answering the questionnaire.

There was no significant difference in age (Student's t-test, p= 0.94), or gender (chi-square test, p=0.46) between cases and non-cases (Table 1).

Analytical epidemiology

In a univariate analysis, the strength of association between the risk of becoming a case and 40 exposures was calculated. Of these, four exposures were significantly ($p<0.05$) associated with illness; these are shown in Table 2. From this univariate analysis, chicken liver parfait was the variable most strongly associated with illness, with a risk ratio (RR) of 30.08.

Of variables significantly associated with illness, chicken liver parfait, onion marmalade and the mixed leaf salad were served in the same set dish. Whilst cheesecake is positively associated with illness, it only explains 14 of the 24 cases, whereas chicken liver parfait explains 23 of the 24 cases.

To examine potential confounding and effect modification between variables, significant exposures ($p<0.05$) were stratified for exposure to chicken liver parfait and Mantel-Haenszel RRs calculated (Table 3). Consumption of chicken liver parfait strongly confounded each of these variables, and after stratification the association between these exposures and illness was no longer significant.

Multivariable analysis was conducted using logistic and binary regression models. The four variables significantly associated with illness in the univariate analysis were included in an initial logistic regression

model. Variables were then removed in a stepwise fashion, in the order of the univariate p value, and a likelihood ratio (LR) test was conducted. As these models did not have significantly different log likelihoods (LR test p<0.05), the original model was used. To report RRs, an equivalent binary regression model was fitted to the data; these results are shown in Table 4.

As the results of the multivariable model show (Table 4), when adjusting for other significant exposures, chicken liver parfait (RR= 27.8, 95% CI: 3.9-199.7) remained significantly associated with illness.

Microbiology

Due to the time between the event and notification of the outbreak (10 days), no samples of food from the wedding remained for microbiological analysis. However, environmental samples from the kitchen were taken. Based on results from these environmental samples, the general hygiene of the premises was determined to be satisfactory.

Discussion

These results show a very strong association between consumption of chicken liver parfait at the wedding breakfast and *Campylobacter* illness. The multivariable analysis of food items demonstrates that even after adjusting for confounding variables, guests who ate chicken liver parfait had a risk of illness that was 28 times greater than guests who did not eat this food.

An investigation by Environmental Health Officers identified concerns about the method used to prepare the chicken liver parfait for this event. Information from the hotel indicates that after mixing raw chicken livers with a red wine reduction and raw eggs, the parfait mixture was heated, using a bain marie (water bath), to a core temperature of 65°C and then immediately removed from the oven and cooled for 15 minutes. According to the UK Food Standards Agency advice, if liver is cooked at 65°C, it should be held at this temperature for at least ten minutes to ensure adequate cooking [10].

One of the most positive elements in the implementation of this study was the high response rate (92%) to the postal questionnaire. This may have been due to factors such as the prompt posting of the questionnaire after the wedding, the type of event concerned and the high proportion of guests reporting illness. Other factors, such as the relatively short length of questionnaire, the inclusion of a personalised letter, first class postage, the inclusion of a stamped and addressed return envelope, and follow up contact of non-respondents, have all been previously associated with increasing response rates to postal questionnaires [11].

It is possible that the study was affected by an ascertainment bias, in that the suggestion that chicken liver parfait had caused the outbreak may have circulated among guests, biasing their responses in the questionnaire. However, the number of portions recorded as

Table 2

Exposures associated with illness with a risk ratio greater than 1.5, ranked by p value, campylobacteriosis outbreak, United Kingdom, June 2010

	Exposed			Unexposed					
Exposure	Total	Cases	AR%	Total	Cases	AR%	Risk ratio	95% CI	p_{exact}
Chicken liver parfait	26	23	88.46	34	1	2.94	30.08	4.34-208.44	<0.001
Onion marmalade	22	19	86.36	38	5	13.16	6.56	2.85-15.11	<0.001
Mixed leaf salad	17	14	82.35	43	10	23.26	3.54	1.97-6.36	<0.001
Cheesecake	24	14	58.33	36	10	27.78	2.10	1.12-3.93	0.03
Water	42	20	47.62	18	4	22.22	2.14	0.85-5.38	0.09
Cheese	11	7	63.64	49	17	34.69	1.83	1.02-3.31	0.1
Spinach	30	15	50.00	30	9	30.00	1.67	0.87-3.20	0.2
Biscuits	8	5	62.50	52	19	36.54	1.71	0.90-3.26	0.3
Fruit	3	2	66.67	57	22	38.60	1.73	0.73-4.10	0.6

AR: attack rate; CI: confidence interval.

Table 3

Adjusted risk ratio after stratification by chicken liver parfait exposure, with percentage change, campylobacteriosis outbreak, United Kingdom, June 2010

Exposure	Crude		Exposed stratum	Unexposed stratum	M-H adjusted		Percentage change (%)
	RR	95% CI	RR	RR	RR	95% CI	
Onion marmalade	6.56	2.85-15.11	1.13	0.00	1.12	0.70-1.79	-82.92
Mixed leaf salad	3.54	1.97-6.36	0.97	0.00	0.97	0.73-1.28	-72.69
Cheesecake	2.10	1.12-3.93	1.14	0.00	1.09	0.77-1.52	-48.31

CI: confidence interval; M-H: Mantel-Haenszel; RR: risk ratio.

having been eaten in the questionnaires was similar to the hotel's estimate of portions served, suggesting that the effect of this bias was inconsequential. Also, the case definition was such that guests reporting diarrhoea or vomiting, independent of other symptoms, were included as cases. This may have led to the misclassification of non-cases as cases, reducing the strength of observed associations.

The outbreak investigation was conducted in a timely fashion, which minimised recall bias in questionnaire responses and enabled prompt implementation of control measures. As a result of this outbreak investigation, the hotel, one of a group of six, reviewed their catering operations, removing certain high risk foods from their menus and implementing quarterly unannounced kitchen inspections.

Of the 25 foodborne *Campylobacter* outbreaks linked to chicken liver parfait/pâté reported to the HPA between 1992 and 2009, 17 were recorded to have been due to errors in food handling during preparation of the chicken liver dishes. These food handling errors included inadequate cooking of blended livers in a bain marie [5].

From 2007 to 2009, the proportion of foodborne *Campylobacter* outbreaks in England and Wales that were linked with chicken liver dishes increased significantly [12], indicating that the consumption of this food is a public health issue of escalating importance.

From the evidence available, it is likely that the cooking method used for the chicken liver parfait was insufficient to ensure that the food was free from *Campylobacter* bacteria. These findings demonstrate the importance of influencing catering practice with regard to the cooking of chicken livers, to reduce the risk of campylobacteriosis outbreaks.

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Table 4

Multivariable binary regression model of implicated food items, reporting risk ratios, campylobacteriosis outbreak, United Kingdom, June 2010

Exposure	RR	p	95% CI
Chicken parfait	27.8	0.001	3.9-199.7
Onion marmalade	1.2	0.374	0.8-1.9
Mixed leaf salad	0.9	0.191	0.9-1.1
Cheesecake	1.1	0.708	0.8-1.5

CI: confidence interval; RR: risk ratio.

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National outbreak of *Salmonella* Typhimurium (Dutch) phage-type 132 in the Netherlands, October to December 2009

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Between October and December 2009, 23 cases of *Salmonella* Typhimurium (Dutch) phage type 132, each with an identical multiple-locus variable-number tandem-repeat analysis (MLVA) profile (02-20-08-11-212), were reported from across the Netherlands. A case–control study was conducted using the food-consumption component of responses to a routine population-based survey as a control group. The mean age of cases was 17 years (median: 10 years, range: 1–68). Sixteen cases were aged 16 years or under. Raw or undercooked beef products were identified as the probable source of infection. Consumers, in particular parents of young children, should be reminded of the potential danger of eating raw or undercooked meat.

Introduction

Salmonella enterica subsp. *enterica* serotype Typhimurium (*S.* Typhimurium) has historically been an important cause of human gastrointestinal disease in the Netherlands [1,2]. The Dutch laboratory surveillance network for gastroenteric pathogens was established in 1987, in which 15 of the 16 regional public health laboratories participate. It serves general practices and district and university hospitals and has been estimated to cover approximately 62% of the Dutch population [3]. *Salmonella* isolates from human, animal, food and environmental samples are sent to the National Salmonella Centre in the Dutch National Institute of Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu, RIVM), where they are sero- and phage typed and are reported on a weekly basis.

On 9 November 2009, the centre reported six clinical isolates (confirmed between 4 and 9 November 2009) of an unusual phage type, *S.* Typhimurium (Dutch) phage type 132 (ft132) to the Epidemiology and Surveillance Unit at RIVM. This phage type had been first identified in chickens in the Netherlands in the early 1980s [2]. Until November 2009, there had been no further reports of this strain in either animals or humans in the country. On 16 November 2009, a further five clinical isolates of the same phage type were reported, prompting immediate investigation. Cases were traced through routine surveillance and were invited to respond to an open-ended, hypothesis-generating questionnaire. When asked what they believed the source of their infection to be, four cases implicated 'ready-to-eat' minced or ground raw beef in the form of steak tartare (also known as filet américain); three cases implicated rare or undercooked beef as the source. These findings led to our hypothesis that consumption of raw or rare contaminated beef products was associated with infection with *S.* Typhimurium ft132. RIVM reported the outbreak to the Food and Consumer Product Safety Authority (Voedsel en Waren Autoriteit, VWA) on 1 December 2009.The aim of the study presented here was to test the association between consumption of raw or undercooked meat and infection with *S.* Typhimurium ft132 and to identify other potential risk factors.

Methods

To test the hypothesis that consumption of raw or rare contaminated beef products was associated with infection with *S.* Typhimurium ft132, a retrospective case–control study was conducted.

Case definition

As *S.* Typhimurium ft132 had not been reported in humans before, a case was defined as any individual who had laboratory-confirmed *S.* Typhimurium ft132 infection in the Netherlands – a time period was not specified.

Selection of controls: the quarterly control-survey

Controls were drawn from a random selection of people from the Dutch general population. In the Netherlands, all individuals are registered with a unique number in the municipality in which they reside. Since 2008,

Figure 1

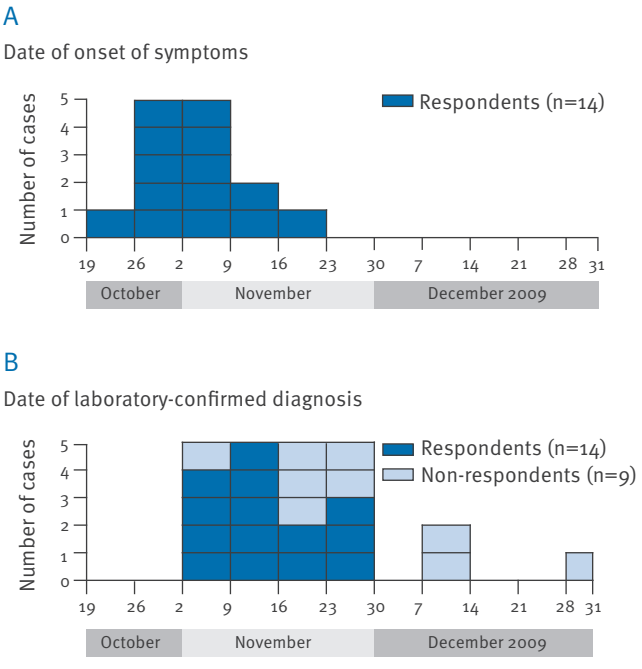
Geographical distribution of *Salmonella* Typhimurium ft132 respondent cases (n=14) and controls (n=121[a]) by postal code, the Netherlands, October – December 2009

[a] Postcodes were not provided by three controls.

Source: National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu, RIVM).

Figure 2

Cases of *Salmonella* Typhimurium ft132 by (A) date of symptom onset of questionnaire respondents (n=14) and by (B) date of laboratory-confirmed diagnosis for all cases (n=23), the Netherlands, October 2009 – December 2009



RIVM has received annually a computer-generated random selection of approximately 500 people from each of the 38 municipalities in the country (a total of approximately 20,000 individuals per year). From this pool, each quarter RIVM selects (using the random number generation function of Microsoft Excel) a simple random subsample of 300 to 500 people to take part in a survey of risk factors for food-borne and other infections. A questionnaire is sent by post to the selected people; if the sampled individual is under 16 years, a parent or guardian is asked to complete the questionnaire on the child's behalf. The survey (known as a control-survey) was designed for use as a control group for enhanced surveillance and outbreak investigation of food-borne and some respiratory diseases [4]. The questionnaire includes 36 questions related to demography, medical history, and gastrointestinal illness and other symptoms and behaviours in the previous 30 days: history of travel, eating in restaurants, visiting farms and other contact with domestic and farm animals. Questions also relate to the nature and type of food consumed in the week before receipt of the questionnaire (meat, fish, dairy products, fruit and vegetables). The response rate is typically over 30%.

As a faecal sample was taken from the first case of *S.* Typhimurium ft132 infection on 27 October 2009, and as the incubation period is between six and 72 hours, controls were defined as those who responded to the questionnaire (as part of the control-survey) between 20 October and 30 December 2009.

Interview of cases

Cases were invited to complete a questionnaire, by telephone or by post. Compared with the questionnaire used for controls, the questionnaire for cases was more detailed with regard to the type and brand of each food consumed and the name and address of each shopping location visited. However, questions used in this study to compare cases and controls were the same.

Statistical analysis

Data were analysed using STATA 10.1. Odds ratios adjusted for age group and sex with 95% confidence intervals were generated using multiple logistic regression. The mean time between date of onset of illness and laboratory-confirmed diagnosis was also calculated.

Laboratory diagnosis

Faecal samples were examined by medical microbiologists and isolates were sero- and phage typed at the National Salmonella Centre. Multiple-locus variable-number tandem-repeat analysis (MLVA) followed the method described by Lindsted *et al.* [5] using the new nomenclature described by Larsson *et al.* [6]. The Food and Consumer Product Safety Authority conducted a trace-back investigation based on reported place of purchase and/or consumption of the suspected foods. When possible, leftovers of the suspected foods were

collected at cases' domicile and tested for presence of *S.* Typhimurium ft132.

Results

Descriptive analysis of cases

A total of 23 cases of S .Typhimurium ft132 infection with an identical MLVA profile (02-20-08-11-212) [6] were confirmed by laboratory diagnosis between 4 November and 30 December 2009. Of these, 10 were male. The mean age of the cases was 17 years (median: 10 years; range: 1–68), 16 cases were children aged 16 years or under, five were aged 17–49 years and two were 50 years or older.

A total of 14 cases responded to the questionnaire. These cases were widely dispersed, coming from 13 different municipal health service districts across the Netherlands (Figure 1).

The respondent cases became ill between 21 October and 16 November 2009 (Figure 2A). The mean time between onset of illness and laboratory-confirmed diagnosis was 10.6 days (range: 5–16) (Figure 2B). Symptoms of these 14 cases included diarrhoea (n=13), abdominal pain (n=12), fever (n=10), vomiting (n=9), nausea (n=8) and blood in stools (n=7).

The mean duration of illness of respondents (n=14) was 13.9 days (range: 5–15). Eight patients were hospitalised: seven had been discharged at the time of interview and one case with a serious underlying medical condition died. Four cases reported that household members were also symptomatic (n=5). In the week before the onset of symptoms, eight respondents had had contact with domestic animals, two had visited a foreign country and one had been to a large public event.

Case–control study

In October to December 2009, 342 people were invited to complete the questionnaire for the national quarterly control-survey. Of those, 38% (n=130) responded, of whom 124 met the control definition. Respondent cases and controls were similar in terms of sex: 50% (n=7) of cases and 38% (n=47) of controls were male, p=0.379. Controls were older than cases; 90% (n=112) of controls and 7% (n=1) of cases were aged over 16 years, but there was no difference in the proportion of children (40%) and adults (47%) who reported consuming raw or undercooked meat. Therefore, age was not considered to be a confounding factor in the relationship between the consumption of raw or undercooked meat and being a case.

When differences in exposure to the most commonly reported foods between cases and controls were examined, nine cases (64%) and 54 controls (44%) reported consuming beef that was eaten raw or rare. This included steak tartare, ossenworst (a raw beef sausage prepared with herbs) and rare fillet of beef. The association between each type of food and being a case was tested with adjustment for age group and sex (Table). The odds ratio (OR) of being a case after eating either 'ready-to-eat' raw beef (steak tartare or ossenworst) or fillet of beef eaten rare was 15.38 (95% confidence interval (CI): 1.8 to 131.2, p=0.012). When the analysis was repeated using the ready-to-eat raw beef products only, the odds ratio was 28.8 (95% CI: 1.7 to 490.1, p=0.02). Of respondents, 28% of cases (n=4) and 5% of controls (n=6) reported shopping at a particular supermarket chain (OR: 7.87, 95% CI: 1.36 to 39.11, p=0.001), but it was not possible to say where particular products had been purchased and no common restaurant or other public eatery was reported.

Trace-back investigation

After RIVM reported the outbreak on 1 December 2009 to the Food and Consumer Product Safety Authority, the latter conducted a trace-back investigation, testing suspected beef product samples (minced beef) submitted by two cases. No evidence of *S.* Typhimurium was found in either sample. Given the short shelf life

Table

Most commonly consumed foods reported by cases (n=14) and controls (n=124), the Netherlands, October – December 2009

Type of food consumed	Cases (n=14)		Controls (n=124)		Adjusted OR[a]	95% CI	P value
	n	%	n	%			
Beef eaten raw or rare[b]	9	64	54	44	15.38	1.80–131.16	0.012
Chicken or turkey	8	57	77	62	0.1	0.01–1.09	0.059
Fish or shellfish	7	50	67	54	0.74	0.17–3.37	0.704
Sausage meat	6	43	59	48	0.64	0.13–3.03	0.575
Minced pork	5	36	60	48	0.38	0.07–1.99	0.252
Snack sausages	3	21	19	15	1.55	0.22–10.68	0.658
Mixed pork and beef mince	3	21	23	19	0.16	0.02–1.26	0.082
Salad	3	21	74	60	0.19	0.03–1.06	0.059
Ham	3	21	49	40	0.61	0.10–3.64	0.594

CI: confidence interval; OR: odds ratio.

[a] Adjusted for sex and three age groups (‹5 years, 5–16 years and ›16 years).

[b] Includes steak tartare, ossenworst and rare fillet of beef.

of ready-to-eat raw meat products, samples from the supermarket chain were not available for analysis by the time of the investigation. No common meat supplier was identified among all the different supermarket chains where cases reported to have purchased meat products in the week before the onset of symptoms.

European investigation

On 23 November 2009, an appeal was made (via the European Centre for Disease Prevention and Control) to European Union Member States for information regarding recent identification of *S.* Typhimurium with the same MLVA pattern (02-20-08-11-212). No country in Europe reported cases infected with *S.* Typhimurium with the same MLVA pattern, either before or at the time of this outbreak.

Discussion

An unusual and identifying feature of this outbreak was the unique *Salmonella* strain involved, and the fact that the MLVA patterns of all the isolates were identical. Although the outbreak was small and the trace-back investigation inconclusive, the epidemiological investigation pointed to ready-to-eat raw or undercooked beef products as the probable vehicle of infection.

Our investigation was limited by a number of factors: small sample size, lack of available material for sampling given the short shelf life of ready-to-eat raw meat products, and a 10-day interval between onset of illness and laboratory-confirmed diagnosis, resulting in potential recall bias among the cases.

From a methodological perspective, use of a routinely surveyed population as a control group, for which known risk factors for food-borne disease have been assessed, proved effective and timely. After a food-borne outbreak, controls are often questioned about their food intake weeks to months earlier. In this study, controls returned questionnaires throughout the outbreak period and as they reported their food consumption in the week before receiving the questionnaire, their responses were potentially more reliable and less susceptible to recall bias than those of controls used in other similar retrospective studies. The surge in manpower required to conduct a case–control study after an outbreak (finding and interviewing controls and creating a database) is also reduced. For these reasons, we recommend this approach. The control-survey should be reviewed as necessary to take account of newly recognised or seasonal links to food and behaviours that might place individuals at risk of food-borne infection.

In this outbreak, 70% of those affected were children, Age-specific rates of salmonella infection and rates of hospitalisation are typically highest among children (although *Salmonella* spp. can cause disease in persons of any age) [7]. In the control group, only 10% of respondents were children. Given that control responses had already been received at the time of the investigation, matching by age was not possible *a priori*. Age matching would have lead to a better ratio of cases to controls across age strata in adults thus allowing a better examination of the effect of age. Age was not considered a confounding factor in this study, however, as similar proportions of adults and children consumed raw or undercooked meat. To achieve a better representation of groups known to be vulnerable to *Salmonella* and other infections, oversampling of young children and elderly people would be of benefit when conducting the quarterly control-survey.

Studies have shown considerable stability of individual food habits over time [8,9]. The optimal frequency for a routine control-survey that is appropriate for use as control group for food-borne infectious disease outbreaks will depend in part on seasonal variation of food intake and in part on the frequency and nature of food-borne outbreaks in the country in question. Taking into account resource requirements, a control-survey every three months is considered optimal in the Netherlands.

This is the fourth food-borne outbreak in recent years linked to consumption of steak tartare and other raw beef products in the Netherlands [10-12]. In 2006 to 2008, despite intensive monitoring and control programmes, *Salmonella* was still found in-store in raw meats (such as steak tartare and ossenworst) intended for direct consumption [13]. Consumer awareness of the potential hazard of eating raw meat is central to good control. In particular, parents should be reminded that children are vulnerable to *Salmonella* infection and should not eat products containing raw or undercooked meat.

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Differences in national influenza vaccination policies across the European Union, Norway and Iceland 2008-2009

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In 2009 the second cross-sectional web-based survey was undertaken by the Vaccine European New Integrated Collaboration Effort (VENICE) project across 27 European Union (EU) member states (MS), Norway and Iceland (n=29) to determine changes in official national seasonal influenza vaccination policies since a survey undertaken in 2008 and to compare the estimates of vaccination coverage between countries using data obtained from both surveys. Of 27 responding countries, all recommended vaccination against seasonal influenza to the older adult population. Six countries recommended vaccination of children aged between six months and <18 years old. Most countries recommended influenza vaccination for those individuals with chronic medical conditions. Recommendations for vaccination of healthcare workers (HCW) in various settings existed in most, but not all countries. Staff in hospitals and long-term care facilities were recommended vaccination in 23 countries, and staff in out-patient clinics in 22 countries. In the 2009 survey, the reported national estimates on vaccine coverage varied by country and risk group, ranging from 1.1% - 82.6% for the older adult population; to between 32.9% -71.7% for clinical risk groups; and from 13.4% -89.4% for HCW. Many countries that recommend the influenza vaccination do not monitor the coverage in risk groups. In 2008 and 2009 most countries recommended influenza vaccination for the main risk groups. Hovewer, despite general consensus and recommendations for vaccination of high risk groups many countries do not achieve high coverage in these groups. The reported vaccination coverage still needs to be improved in order to achieve EU and World Health Organization goals.

Background

Influenza has a large impact on both individuals and the general population and can cause severe disease and deaths. The disease burden varies from year to year among countries, making it hard to estimate the annual number of deaths or economic impact. Large numbers of mild to moderate cases can result in time off work and losses to production as well as increased pressure on and costs to the health and social care services.

The estimated excess of deaths due to influenza in milder influenza seasons was around eight deaths per 100,000 population; in more severe inter-pandemic years 44 per 100,000 [1]. Another study found an average of 25 excess deaths per 100,000 between 1989 and 1998 [2]. Applying the above estimated excess mortality attributable to seasonal influenza to the European Union (EU) population, approximately 500 million in 2008, would result in between 40,000 excess deaths in a moderate season and 220,000 in a severe season [3]. These are crude figures and are not adjusted for influenza vaccination coverage in vulnerable groups or the rising proportion of very old and vulnerable people in European countries.

However, during the 2009 A(H1N1) pandemic only 4,879 A(H1N1)-associated deaths were reported to the World Health Organization (WHO) Regional Office for Europe. Excess deaths and the crude figures provided above should however be interpreted with caution.

In 2003, the World Health Assembly (WHA) of the WHO recommended increasing seasonal influenza vaccination coverage to all people at high risk of influenza or

its complications, with the goal of attaining at least 50% vaccination coverage of the elderly population by 2006 and 75% by 2010 [4].

On 13 July 2009 the European Council of Ministers recommended that EU Member States (MS) adopt and implement national action plans to achieve a vaccination coverage rate of 75% in all at risk groups by the winter season of 2014-15. Risk groups were defined as individuals 65 years and older, and people with underlying medical conditions in the following categories: chronic respiratory and cardiovascular diseases; chronic metabolic disorders; chronic renal and hepatic diseases; immune system dysfunctions (congenital or acquired) [5].

Since late 2007, the Vaccine European New Integrated Collaboration Effort (VENICE) Project, in collaboration with the European Centre for Disease Prevention and Control (ECDC), 27 EU and two European Economic Area (EEA) MS, conducted two surveys regarding national seasonal influenza vaccination in these countries [6].

The first survey, conducted in January 2008, provided baseline information on seasonal influenza vaccination policies and immunisation programmes in EU/EEA MS,

Table 1

Age groups for which influenza immunisation is recommended, without other risk indication: national seasonal influenza vaccination survey in Europe, July 2009 (n=27 participating countries)

Age group/ Country	Children (months/years)			Adults (years)						
	6 months- 2 years	6 months- 3 years	6 months- ‹ 18 years	› 18 - 49	› 18 - 64	≥ 50	≥ 55	≥ 59	≥ 60	≥ 65
Austria			X	X		X				
Belgium										X
Cyprus										X
Czech Republic										X
Denmark										X
Estonia			X	X	X					X
Finland		X								X
France										X
Germany									X	
Greece									X	
Hungary									X	
Iceland									X	
Ireland[a]						X[a]				
Italy										X
Latvia	X									X
Lthuania										X
Malta							X			
the Netherlands									X	
Norway										X
Poland							X			
Portugal										X
Romania										X
Slovakia			X					X		
Slovenia	X									X
Spain										X
Sweden										X
United Kingdom										X

[a] In Ireland vaccination is recommended for the ≥ 50 age group but only the ≥ 65 age group routinely qualifies for free vaccination.

identified specific recommendations for different risk groups in each country and obtained vaccination coverage data for the 2006-7 or previous influenza seasons [7,8].

The second survey, conducted in July 2009, sought information on changes in seasonal influenza vaccination policy since the first survey. Updated information on vaccination coverage for the 2007-8 influenza season was also collected in the EU/EEA MS in order to compare it between countries and to identify trends. Additionally, vaccination coverage was investigated at the sub-national level. The final report of survey will be available on the VENICE website following publication of this paper (http://venice.cineca.org) [6].

Methods

A cross-sectional web-based survey was undertaken. This survey was a collaborative study between the ECDC, the VENICE project and EU/EEA MS. Gatekeepers, experts who represent national public health institutions and other national contact points had previously been identified. They are responsible for conducting all VENICE surveys in their respective countries [6]. There are currently 27 EU and two EEA (Norway and Iceland) participating countries in the VENICE project.

The questionnaire used in the 2009 survey was based on the one used for the 2008 survey [7]. The web-based platform was developed by a non-profit consortium of universities (CINECA, Bologna, Italy), and the survey was made available on the platform to all participating countries [9]. Gatekeepers in each MS entered data directly on-line. The questionnaire contained prefilled data from the previous survey and gatekeepers had to update them if necessary. MS were asked to complete the electronic questionnaire in July to August 2009. Gatekeepers were asked to validate data contained in the draft report.

The survey questionnaire used predominantly closed questions. The questionnaire consisted of two parts: the main survey in which questions remained essentially the same as in the 2008 survey and the second part where countries were requested to provide vaccination coverage data at sub-national level if available.

Table 2

Underlying/medical conditions, occupational settings and other groups for which influenza immunisation is recommended without regard to age: national seasonal influenza vaccination survey in Europe, July 2009

	Number of countries where vaccination is recommended (%)
Medical/Underlying conditions	
Chronic pulmonary diseases	27 (100)
Cardiovascular disease	27 (100)
Renal disease	25 (93)
Hepatic disease[a]	15 (58)
Haematological or metabolic disorders	26 (96)
Diseases of the immune system	25 (93)
HIV/AIDS[a]	24 (92)
Children taking aspirin[a]	18 (69)
Pregnancy	10 (37)
Any condition that may compromise respiratory function	12 (44)
Occupational setting	
Hospitals	23 (85)
Long-term care facilities	23 (85)
Out-patient care clinics	22 (81)
Laboratory staff[a]	8 (31)
Essential services (police, firemen)	6 (22)
Veterinary services	9 (33)
Poultry industry	13 (48)
Families that raise poultry[a]	4 (15)
Military	6 (22)
Other groups	
Residents of long-term care facilities	22 (81)
Household contacts for whom vaccination is recommended	14 (52)

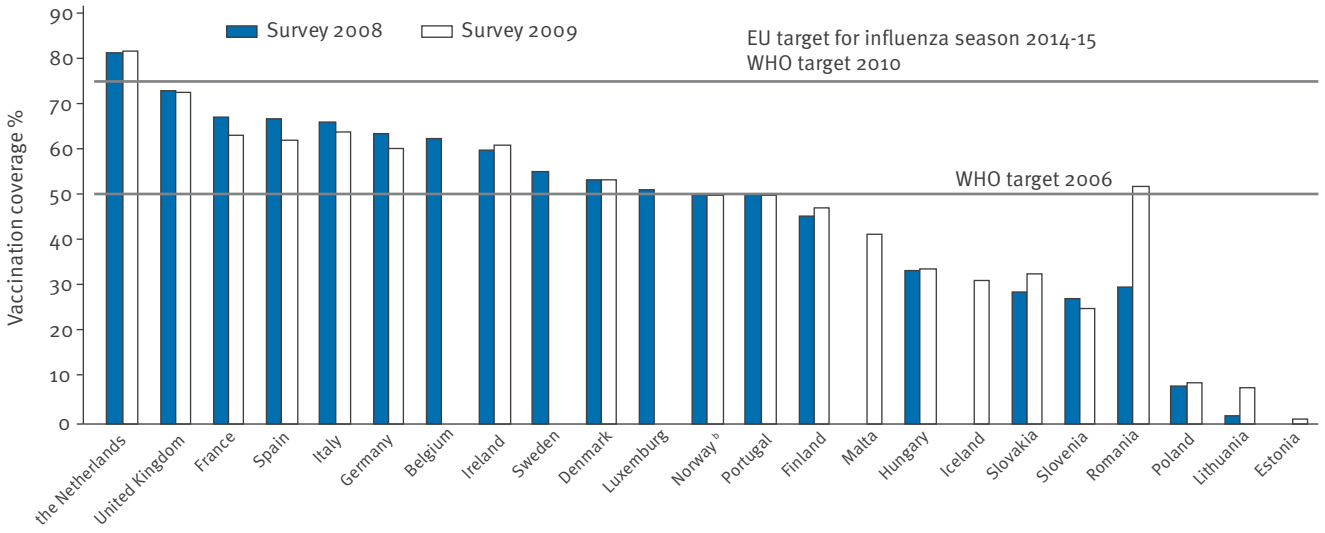
[a] Twenty six countries responded to these questions. Percentage calculated from 26.

Information sought in the questionnaire related to which population groups were recommended for influenza vaccination (by age, occupation, medical risk or social situation), recent vaccination coverage results by population group, season and sub-national level and planned policy- or operational changes over the next two years.

We compared vaccination coverage for the elderly population, clinical risk groups and healthcare workers

Figure 1

Vaccination coverage for seasonal influenza among the elderly in EU/EEA[a] countries: national seasonal influenza vaccination surveys in Europe, January 2008 and July 2009



WHO: the World Health Organization.

[a] For 23 EU/EEA Member States.

[b] Vaccine coverage calculated for the over 65 age group and clinical risk groups together.

Vaccine coverage data for Survey 2008: Belgium – 2003-4 influenza season; Germany, Poland – 2005-6 influenza season; the remaining countries – 2006-7 influenza season.

For Survey 2009 all countries reported vaccination coverage data for the 2007-8 influenza season.

The age limit for elderly varies by country from between 50 and ≥65.

Table 3

Vaccination coverage for seasonal influenza for clinical risk groups and/or HCW in 11 EU/EEA countries: national seasonal influenza vaccination surveys in Europe, January 2008 and July 2009[a]

	Vaccination coverage for clinical risk groups (%)		Vaccination coverage for HCW (%)	
	Survey 2008	Survey 2009	Survey 2008	Survey 2009
the Netherlands	75.2	71.7	-	-
Norway[b]	50	50	-	-
Germany	48.5	49	27	23
Belgium	47	-	-	-
United Kingdom	42.1	45.3	14	13.4
France	35	52	48	-
Hungary	-	32.9	23.7	23.5
Ireland	27.6	-	20	-
Romania	-	-	-	89.4
Portugal	-	-	40	26
Spain	-	-	34.9	28.1

EEA: European Economic Area; EU: European Union; HCW: Healthcare workers

[a] EU target for influenza season 2014-15 – 75%.

[b] Vaccine coverage was calculated for the ≥65 age group and clinical risk groups together.

Influenza season provided for clinical groups for Survey 2008: Belgium 2003-4; Germany, Ireland – 2005-6; the remaining countries – 2006-7.

Influenza season provided for HCW for Survey 2008: France – 2004-5; Germany, Ireland – 2005-6; the remaining countries – 2006-7.

All countries reported vaccination coverage data for Survey 2009 for the 2007-08 influenza season.

(HCW) obtained from the two consecutive surveys. As the influenza season for which vaccination coverage data was reported by country varied, we refer to vaccination coverage data as that reported in 'Survey 2008' (influenza seasons 2003-4 to 2006-7) or 'Survey 2009' (influenza season 2007-8) in the paper. The data on influenza policy changes refer to the 2008-9 influenza season. Data in relation to future changes related to the influenza season 2009-10, before knowledge of the pandemic influenza A(H1N1) virus.

The data presented in this paper on number of doses of influenza vaccine used in MS per 10,000 population at risk, was calculated using EU country specific estimates of the population for the two major risk groups (elderly population and clinical risk groups) as calculated by ECDC in August 2008 using methodology described by Fleming and Eliot [10,11]. Data for the number of vaccine doses used were provided by gatekeepers and are presented by influenza season. The number of doses used was not accounted for if children were recommended to receive two vaccine doses.Our data is unable to identify doses by age group.

The elderly population was defined as those individuals for whom seasonal influenza vaccine was recommended by age in each country. The age limit for influenza vaccine recommendation in elderly varied by country from 50 to ≥ 65 years of age.

Results

In total, 27 of 29 countries responded to the questionnaire. Bulgaria and Luxembourg did not respond to the questionnaire.

Groups recommended for vaccine

Age groups

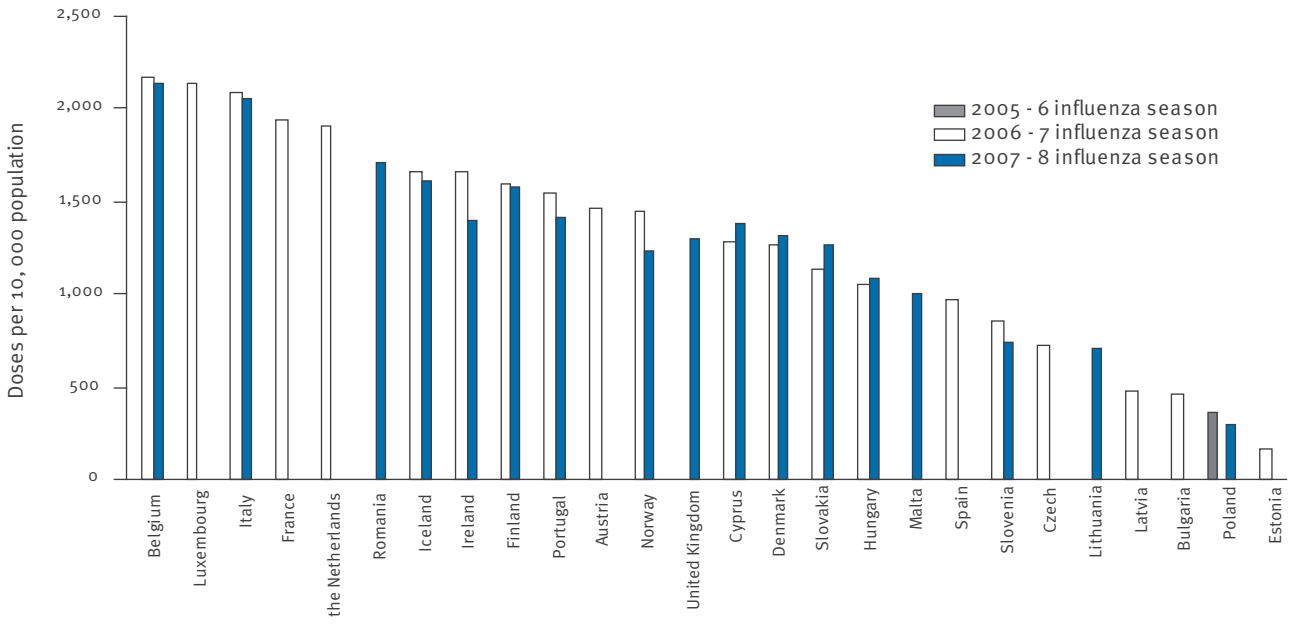
Two countries (Austria and Estonia) recommend vaccination for all age groups. Six countries (Austria, Estonia, Finland, Latvia, Slovakia and Slovenia) recommend vaccination for different age groups < 18 years of age, regardless of risk conditions. Finland is the only country to have introduced routine vaccination of children aged from six months to three years (since the beginning of the 2007-8 influenza season). Other countries have also recommended childhood vaccination but have not included it in the routine childhood programmes: Slovenia and Latvia recommended vaccination of children aged six months to two years; Slovakia, Estonia, Austria of children and adolescents aged six months to 18 years.

All countries recommend vaccination of the elderly population; however the age specified differs between countries. Seventeen countries (63%) recommend seasonal influenza vaccination for individuals 65 years and older. Vaccination is recommended for those aged 60 years and older in Iceland, Hungary, the Netherlands, Germany and Greece; in Malta and Poland vaccination is recommended for those aged over 55 years; in Austria and Ireland for those over 50 years. Slovakia recommends seasonal influenza vaccination for those aged 59 years and more (Table 1).

Changes since the last survey were identified in some countries. In Ireland, the age group recommended for vaccination was lowered from 65 to 50 years of age and older (even for those without risk conditions), however only individuals ≥ 65 years are presently provided vaccine free of charge. Poland reported that the age group for which vaccination was recommended was 55 years

Figure 2

Number of doses of influenza vaccine used by country per 10,000 population in the EU/EEA for the 2005-6 – 2007-8 influenza seasons: national seasonal influenza vaccination surveys in Europe, January 2008 and July 2009 (n=26)[a]



[a]Germany has only data on number of licensed doses, but do not have data on doses actually used.

and older (instead of 50 years in the 2008 survey); Estonia reported that vaccination is recommended to all age groups (different from the 2008 survey; vaccination was recommended for specific age groups: children from six months to five years and those aged ≥ 65 years).

Medical conditions, occupational settings and other groups

All countries recommend vaccination of patients with chronic pulmonary and cardiovascular disease, and most recommend vaccination of patients with renal and immunologic disorders (25/27) or haematologic and metabolic disorders (26/27). Vaccination of pregnant women is recommended in ten countries (10/27; Austria, Belgium, Cyprus, Denmark, Estonia, Ireland, Italy, Portugal, Slovakia, Spain).

Most countries recommend influenza vaccination of HCW in hospitals, long-term care facilities (23/27) and out-patient clinics (22/27). Few countries have specific vaccination recommendations relating to individuals belonging to essential services and military services (6/27), families that raise poultry (4/26) and veterinary services 9/27). A total of 13 of 27 countries recommend vaccination of workers in the poultry industry.

Seasonal influenza vaccine is recommended for residents of long-term care facilities in 22 countries (81%); more than half of countries (52%) recommend vaccination of household contacts of persons for whom vaccination is recommended. Detailed information is presented in Table 2.

Changes in recommendations

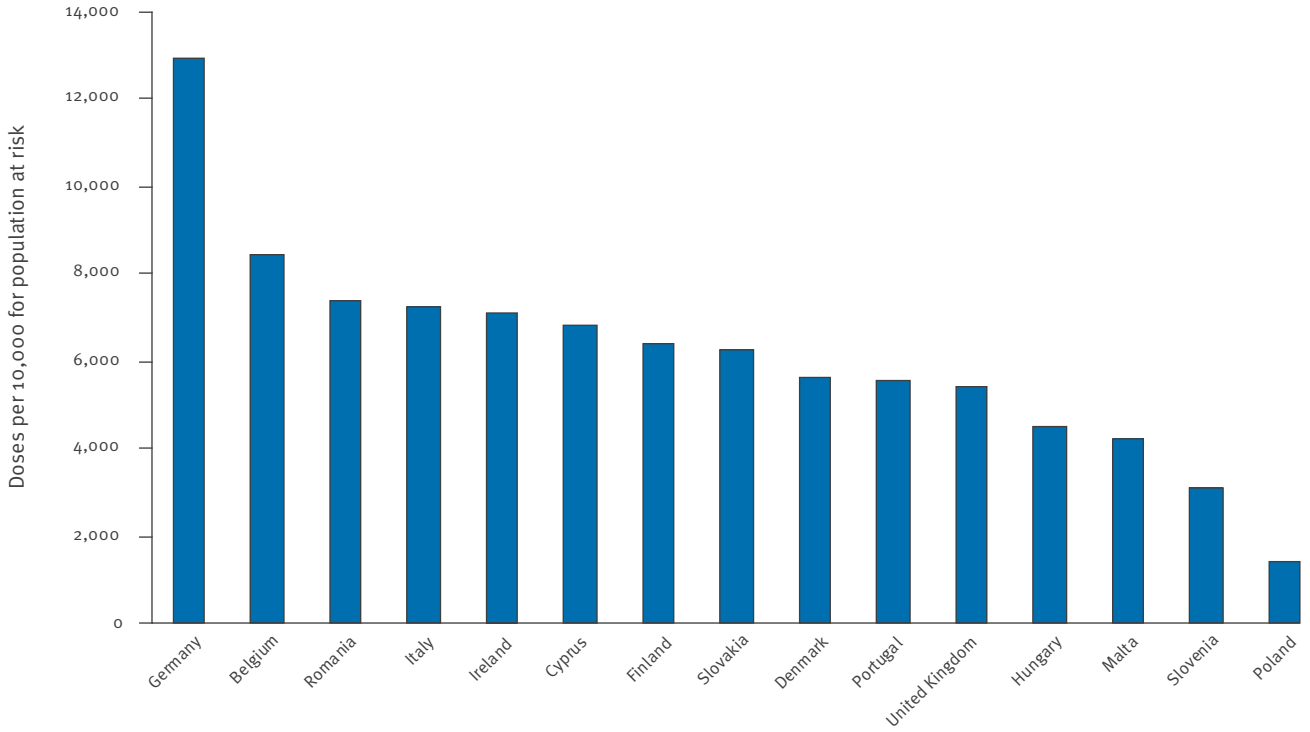
Recommendation changes since the 2008 survey were reported from several countries. Romania and Poland have stopped recommending vaccination for military personnel or those working in the essential services in their countries. Poland no longer recommends vaccine for individuals working in the veterinary services. Iceland has introduced a recommendation to vaccinate those working in veterinary services and the poultry industry.

In comparison to Survey 2008, some countries have expanded the number of risk groups for whom vaccination was recommended in 2009; Slovenia has included patients with hepatic disease in Survey 2009; Cyprus expanded their 2009 recommendations to include patients with compromised respiratory function. In Denmark pregnant women were recommended vaccination whereas Ireland recommended vaccination only for pregnant women with other medical risk conditions in 2009.

Vaccination of household contacts of persons for whom vaccination is recommended was reported by Iceland and France (in the previous survey it was reported as no recommendation). However in France, vaccination is recommended only for household contacts of babies aged ≤ six months with underlying conditions. Denmark and the Netherlands reported that there is no recommendation for that population group.

Figure 3

Number of influenza vaccine doses used in each country expressed as vaccine doses potentially available per 10,000 of those at risk (those aged over 65 and with underlying conditions) by country in the European Union for the 2007-8 influenza season: national seasonal influenza vaccination survey in Europe, July 2009 (n=15)



Vaccination coverage results

The elderly

For Survey 2009, 20 countries provided results about vaccination coverage among the elderly. Three countries (Estonia, Malta, Iceland) who had not reported this age group in the previous survey were able to do so. However two countries, (Belgium and Sweden) which had previously reported this information were unable to do so for Survey 2009 (Figure 1). The lowest/highest range in vaccination coverage for Survey 2009 varied from 1.1% in Estonia to 82.6% in the Netherlands (1.8% in Lithuania to 82.1% in the Netherlands for Survey 2008). There was little change in coverage reported by each country, with a slight increase or decrease across most of the countries, except Romania, where vaccine coverage increased from 30.3% for the 2006-7 influenza season to 52.6% for the 2007-8 influenza season. There was also a substantial increase in vaccination coverage reported in Lithuania rising from 1.8% to 8.1%. The Netherlands (82.6%) met the WHO 2010/EU 2014-15 influenza season target of 75% and the United Kingdom (UK) almost achieved this goal (73.5%).

Clinical risk groups

Compared to eight countries in Survey 2008, six countries provided vaccination coverage results for clinical risk groups for Survey 2009. The range of vaccination coverage varied from 32.9% in Hungary to 71.7% in the Netherlands. The reported vaccination coverage in the UK and France was higher than that reported in 2008. Vaccination coverage in Norway and Germany remained the same, or similar, at 50% and 49% respectively. The Netherlands (71.7%) almost achieved the EU target for influenza season 2014-15 (Table 3).

Healthcare workers

Six countries reported vaccination coverage results among HCW for Survey 2009 versus seven in Survey 2008. The reported vaccination coverage was lower in four of them compared to the previous survey. The range varied from the lowest of 13.4% in the UK to the highest of 89.4% in Romania for Survey 2009 (Table 3).

Sub-national vaccination coverage

One country (Spain) reported differences in sub-national vaccination recommendations within their country. Four countries (Lithuania, Poland, Ireland and Italy) provided data on vaccination coverage at sub-national level for the elderly population. Two countries (Italy and Lithuania) also provided vaccine coverage for the total population in addition to that for the elderly at sub-national level. Vaccine coverage for the elderly population varied slightly between regions in Italy, Ireland and Poland; however a substantial variation between regions was found in Lithuania (range 2.4% to 10.8%) for the 2007-8 influenza season. Data for the sub-national level are not presented in this paper but are available in the final report on the VENICE website [6].

Number of doses of influenza vaccine used in Member States

In both surveys, all countries, except Germany, reported the number of doses of seasonal influenza vaccine used. These data are combined and presented by country and influenza season in Figure 2. The number of doses used in MS varied from 171 doses per 10,000 population in Estonia to 2,167 doses per 10,000 population in Belgium albeit for different influenza seasons. All countries used approximately the same quantity of vaccine for the two seasons.

In Figure 3, the doses of influenza vaccine used in each country for the 2007-8 influenza season are presented as a rate of vaccine potentially available for the at-risk population in each country (i.e. those aged over 65 and with underlying conditions), calculated per 10,000 population at risk. Although clearly not all vaccine used in these countries was given to at-risk individuals, it does demonstrate that in the 2007-8 season a number of countries had enough vaccine to cover two thirds or more of the population at risk in their country (Belgium, Romania, Italy, Ireland, Cyprus, Slovakia and Finland) if the vaccine was used for these priority groups only. In Germany all population at risk could have been covered.

Discussion

This is the second VENICE survey conducted across EU/EEA countries to look at influenza vaccination policy and vaccination coverage. As in the previous survey, participation among the EU/EEA MS was high, with 27 of the 29 contacted countries responding to the survey. Such a high level of participation is encouraging, demonstrating the continued interest that EU/EEA MS have in sharing information on influenza vaccination programmes. Continued participation by the national gatekeepers demonstrates the acceptability of the VENICE methodology to the rapid exchange of information to mutual benefit of all.

There were no major changes in seasonal influenza vaccination policy in comparison to Survey 2008. The main finding was that most countries have implemented WHO or other internationally accepted guidelines in relation to the groups for whom vaccine is recommended. Most countries recommend vaccination in the elderly, people with medical conditions and HCW. Inclusion of other groups for vaccination, such as healthy children and pregnant women, is still relatively uncommon in MS.

The results of two consecutive VENICE surveys indicate that annual seasonal influenza vaccination for children is not common in EU/EEA MS. Only six countries recommend influenza vaccination for children between the age of six months to three years (of which two recommend up to two years only), and of these only Finland has added influenza vaccination to the routine childhood vaccination programme (since the 2007-8 influenza season). In a number of countries outside Europe vaccination is routinely recommended

for young children, because the highest rates of influenza complications and hospitalisations have been reported among young children < 2 years, with rates of hospitalisation similar to the rates of hospitalisation of persons over 65 years [12-15]. Our survey did not attempt to identify reasons why some EU/EEA countries recommend paediatric vaccination and others do not, however it may reflect key issues and knowledge gaps in relation to the lack of data on the burden, vaccine efficacy and/or effectiveness of influenza in children younger than two years old and these have been discussed in an ECDC report [16].

These VENICE surveys clearly demonstrate consensus among the participating countries about the importance of seasonal influenza vaccine for individuals with chronic medical conditions or underlying diseases (e.g. chronic pulmonary, cardiovascular, renal, hepatic diseases). However, there appears to be a lack of consensus in relation to the role of vaccination during pregnancy, as it is only recommended by approximately one third of EU/EEA countries. But even in these countries that do recommend vaccination in pregnancy no data were provided on vaccination coverage for this population group so it is hard to draw conclusions whether these recommendations are implemented. Generally, vaccine coverage for pregnant women in countries where influenza vaccine is recommended tends to be low, varying from <0.1% to 12.8%. Reasons for low coverage in pregnant women could be attributed to inadequate information about safety aspects, risks and benefits of vaccination among both patients and providers [17].

Only two countries had exceeded or nearly reached the WHO 2010 target of 75% vaccination coverage for the elderly. The vaccination coverage among elderly individuals was considerably higher in all countries with available information than among clinical risk groups and HCW.

Although all countries recommend influenza vaccination for their elderly population, five countries (Czech Republic, Cyprus, Austria, Greece, Latvia) were unable to monitor vaccine coverage and were not able to present vaccination coverage data for this specific age group. However, progress was made in three countries (Malta, Iceland and Estonia) which provided this information for Survey 2009 but had been unable to do so in the previous survey. Overall vaccination coverage for the elderly group varied markedly across countries but the uptake reported in each country in the Survey 2009 survey was similar to that reported in the Survey 2008, with the exception of Romania. Those countries which reported high coverage in Survey 2008 maintained similar levels of high coverage, and those with low coverage demonstrated little change between the two surveys. The high vaccination coverage for elderly in the Netherlands and the UK is particularly noteworthy, with coverage rates among the elderly population similar to or even higher than that reported on average in some countries outside Europe (67.2% in the United States (US) for the 2008-9 influenza season; 71% in Canada in 2005; 79.1% in Australia in 2004) [18-20]. Romania reported an approximate doubling in vaccination coverage rates in comparison to the previous season.

The near universal ability of most countries to provide vaccination coverage data for their elderly population is in marked contrast to their ability to provide such data for clinical risk groups and HCW. Only one third of countries provided vaccine coverage data for these groups although recommendations for getting vaccine are long standing in most of the countries. Vaccination coverage rates for both clinical risk groups and HCW were relatively low across countries that were able to report such data, with exception of the Netherlands for clinical risk groups and Romania for HCW, where vaccination coverage was high in both countries for these respective groups. Information related to factors influencing high coverage was not sought but future surveys should seek such information.

As vaccination is mainly recommended for risk groups, an accurate estimate of the size of major risk groups is necessary within each country, in order to procure vaccine for this group and to estimate coverage within the risk group. Knowledge of trends in uptake can influence vaccination policy, procurement and strategy. For instance low levels of uptake by risk group will inform those responsible for vaccine procurement for the following season but in order to reach the EU/WHO goals additional supplies are needed to meet the required increase demand. Estimates of the size of the elderly population are usually easily available in each MS using routine administrative census data. However estimating the size of the clinical risk group population becomes challenging, as not all countries have a chronic diseases register and duplicates in available statistical data can happen. Some countries estimate the risk group denominator using health service utilisation data using international classification of disease (ICD) or diagnosis-related group (DRG) codes. Other countries may use prescribing data for disease-specific common medications. However, use of such data for estimating a denominator may be misleading due to duplications mentioned above (individuals with co-morbidities).

In this study we have used the estimated number of influenza vaccine doses used in each country, expressed as a rate (per 10,000 of total of population at risk) as a very crude indicator to assess supply against need and does not reflect the capacity of the countries. As vaccine procurement must take into account the expected uptake by risk group (usually identified by demand reported in most recent season) most countries will order quantities to match expected demand, to minimise vaccine wastage and inefficient use of public funds. In this survey, two countries (Belgium, Germany) procured sufficient vaccine *per capita* at risk (clinical risk group and elderly), to vaccinate almost all

of the estimated population at risk, if targeted specifically at these groups only.

Six countries (Cyprus, Finland, Ireland, Italy, Romania, and Slovakia) procured vaccine in sufficient quantities that could be used to vaccinate two thirds of the estimated population at risk. In the remaining countries the number of doses of vaccine used is less and at least in Poland vaccine supply would only be sufficient for one in ten of those. Reasons for low influenza vaccination coverage may be attributed to low supply of vaccine in those countries.

The survey limitations were similar to that reported in the previous publication and include different methodologies used to estimate vaccination coverage among the population at risk. Comparison of vaccination coverage data may be difficult across countries as different methods are often used, not only for denominator data but also for numerator data. Denominator data for clinical risk groups are difficult to estimate accurately for a majority of EU/EEA countries, reflecting the lack of information systems (disease registers) or other standardised methodologies. Some countries have used population surveys to estimate the number of at-risk populations. But even this may not be comparable between countries as a variety of methodologies have been used (household surveys, mail, face to face, telephone), each of which has recognised limitations and may depend on the socio-cultural characteristics of the population surveyed. Such surveys are routinely conducted (annually or less frequently) in the US, Australia and Canada and found to be useful [18-21]. Whether in the future it would be feasible for all MS to conduct such studies is worth considering [22-26]. The advantage of conducting studies using standard survey methodology would be an ability to estimate denominator (clinical at risk, occupational risk, and age and gender), at the same time as obtaining information on reasons for vaccination, or non-vaccination, which could be analysed by risk group. If such surveys were to be implemented, timely data for each influenza season could be obtained and progress of immunisation performance could be monitored in relatively real time [27].

In conclusion, results of our survey indicate that recommendations for influenza vaccination exist in most of the countries for the main clinical and occupational risk groups in addition to the elderly. A substantial number of countries have extended the recommendation to those at risk defined by the extremes of age, either older age or young children. Although there is consensus that the elderly should be vaccinated, vaccination coverage for the elderly is lagging in most of the countries and it is unlikely that EU/WHO targets will be met in 2010. Additionally, large discrepancies between recommendations and real vaccination coverage exist for clinical risk groups and HCW; reported vaccination coverage is substantial or low for these groups of individuals and vaccination coverage should be increased. Additional efforts are needed to increase vaccination coverage among these groups and may require research to identify the reasons for non vaccination and address these through more specific promotion campaigns. All countries should strive to collect information on vaccine coverage for the elderly as well as these risk groups, without which monitoring progress is not possible. All countries regardless of their *per capita* spend on vaccine have an interest and need to monitor the usage of vaccine.

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Guidelines for the laboratory diagnosis of genital herpes in eastern European countries

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These guidelines aim to provide comprehensive information about sexually transmitted herpes simplex virus (HSV) infection and its laboratory diagnosis in eastern European countries. They are primarily intended for professionals testing specimens from patients at a sexual healthcare clinic but may also be helpful for community-based screening programmes. In particular, the guidelines recommend: (i) either viral culture or validated and approved nucleic acid amplification tests (NAATs) as the tests of choice for symptomatic patients, which should be promoted for laboratory confirmation of HSV infection; (ii) if culture or NAATs are not available, antigen detection – a direct immunofluorescence test or enzyme immunoassay from samples from symptomatic patients – could be employed, but HSV type determination is of importance; (iii) only type-specific serology should be used for detecting asymptomatic individuals, testing pregnant women at risk of acquiring HSV infection close to delivery, men who have sex with men and people who are HIV positive; (iv) widespread screening for HSV antibodies should be discouraged; and (v) any non-validated diagnostic tests should be validated against a recommended, approved gold standard.

Introduction

During the past 20 years, genital herpes has emerged as one of the most prevalent sexually transmitted infections (STIs). However, data on morbidity due to genital herpes infections in eastern European countries is scarce and their reliability doubtful owing to the lack of validation studies for the diagnostic tests used. The World Health Organization (WHO) has estimated a prevalence of herpes simplex virus type 2 (HSV-2) infection of 29 million cases in men and 12.3 million cases in women in eastern Europe and central Asia in 2003 [1]. The international classification of diseases caused by herpes virus (anogenital) [2] is presented in Table 1.

Human herpes simplex virus infections can be caused by HSV-1 or by HSV-2. In general, infections caused by HSV-1 manifest above the neck and are acquired as a result of close contact with infected persons, usually in childhood. In contrast, the lesions of infections caused by HSV-2 are usually located below the waist and are usually acquired as a result of sexual contact with infected persons later in life. Unfortunately, the differentiation of HSV-1 from HSV-2 based on anatomical site of infection is not absolute, since genital herpes may frequently be caused by HSV-1 as a result of oro-genital sexual practices and *vice versa*. The lesions and natural history of the resulting illnesses are very similar. However, because HSV-2 is almost always associated with genital disease, whereas HSV-1 is associated with both oro-pharyngeal and genital disease, there is often considerable stigma associated with HSV-2 infection. Acquisition of HSV-1 usually results in lesions of the oro-pharynx and around the mouth and on the lips and chin. Occasionally the eyes are affected. Sexual transmission of HSV most often produces infection of the genital mucosa, genital skin (penile and labial) and the perigenital region. Virus from genital secretions

Table 1

International classification of diseases: anogenital herpes virus infection

Classification code	Description
A60	Anogenital herpesviral [herpes simplex] infection
A60.0	Herpesviral infection of genitalia and urogenital tract
A60.1	Herpesviral infection of perianal skin and rectum
A60.9	Anogenital herpesviral infection, unspecified

Source: [2].

can also infect other areas, including the eyes and oropharynx and rectal mucosa [3,4].

Primary herpetic infection, i.e. when an HSV-seronegative person acquires HSV-1 or HSV-2, is usually the most severe manifestation of infection. Children may develop severe oro-pharyngitis following primary exposure to HSV-1. This episode resolves spontaneously, but recurrences may occur as a result of reactivation of the infection that has become latent but persists in the cervical ganglia. Similarly, if an individual has not been exposed to HSV-1 in childhood, he or she may develop severe genital lesions following sexual exposure to HSV-2 later in life. As with HSV-1 infections, primary HSV-2 infections resolve spontaneously but recurrences are likely to occur as a result of reactivation of latent infection that has been established in the sacral ganglia. In cases of initial, non-primary infection, i.e. when a person with antibodies to HSV-1 subsequently acquires HSV-2, the genital infection is less severe, but is also associated with recurrences. In most cases of genital herpes (80–90%) the disease progresses subclinically, but may become symptomatic at any time [5,6]. The incubation period of both HSV-1 and HSV-2 is usually from two to 10 days (up to four weeks). Therefore, the first episode may indicate either recent or long-lasting infection [7].

Recurrent herpetic infection is associated with reactivation of the virus. The recurrences arise with different frequency: from once every few years to several times per month. The localisation of the primary and recurrent lesions usually coincides. Both oral and genital herpes are manifested by acute recurrences followed by varying periods of latency, when the virus remains in a non-multiplying episomal form in the nuclei of the neurons in the ganglia. Classically, each episode or recurrence is characterised by a patch of redness at the site of the recurrence, followed by a localised papular then vesicular rash. The vesicles contain a clear fluid that contains many thousands of infectious viral particles. These vesicles burst, forming shallow ulcers or erosions that eventually crust and heal spontaneously without leaving scars. These episodes usually last less than 10 days, but may be prolonged as a result of secondary bacterial infection or immunosuppression.

Genital and oral herpes are life-long infections. Neonatal herpes (including neonatal encephalitis) and increased risk for acquiring and shedding human immunodeficiency virus (HIV) are the most serious

Table 2

Main clinical symptoms, manifestations and complications of genital herpes infections

Patients	Clinical symptoms	Clinical manifestations	Complications
Females	• Papular and/or vesicular rash on genitals or thighs • Genital ulceration • Dysuria • Vaginal and/or cervical discharge • Dyspareunia • Inguinal discomfort	• Papular and vesicular rash on vulva, perineum, thighs • Urethritis • Vaginal discharge, Dysuria • Dyspareunia • Hyperaemia of the mucous membranes of vulva and vagina • Cervicitis	• Viral meningitis • Radiculomyelopathy with the involvement of sacral nerves • Extensive vesicular skin rash • Increased risk for acquiring and shedding human immunodeficiency virus (HIV)
Males	• Papular and/or vesicular rash on genitals or thighs • Genital ulceration • Perineal pain • Dysuria • Inguinal discomfort	• Papular and vesicular rash on thighs, penis, perineum • Urethral discharge • Dysuria	
Newborns (and/or infants)	• Vesicular skin rash • Keratoconjunctivitis • Mild pyrexia • Lethargy • Convulsions	• Vesicular skin rash • Keratoconjunctivitis • Mild pyrexia • Irritability • Convulsions	• Generalized skin rash • Encephalitis • Infant death

Table 3

Patient type and main indications for testing for genital herpes

Patients	Indications for testing for genital herpes
Males	• Presence of vesicular and/or ulcerative lesions on penis, buttocks or perineum • Symptoms of dysuria following treatment for gonorrhoea and/or nongonococcal urethritis • History of recurrent vesicular and ulcerative genital skin lesions
Females	• Presence of vesicular and/or ulcerative lesions on the genitals, buttocks or thighs • Presence of a mucous or purulent vaginal discharge • History of recurrent vesicular and/or ulcerative genital skin lesions on the genitals, thighs, buttocks, perineum
Newborns	• Born to mothers who had genital herpes during pregnancy • Vesicles, vesicular rash or crusts on skin
Other	• Had sexual contact with a proven case of genital herpes • Being examined for other sexually transmitted infections • Sex workers

consequences of genital herpes infection [8,9]. The main clinical symptoms, manifestations and complications of genital herpes infections are summarized in Table 2.

Importance of laboratory diagnosis of genital herpes

The clinical differentiation of genital HSV infection from other infectious and non-infectious aetiologies of genital ulceration is difficult and laboratory confirmation of the infection should always be sought [5,9]. Accordingly, exclusive reliance on clinical diagnosis could lead both to false positive and false negative diagnosis of the condition [6,9]. HSV is the most common cause of sexually acquired genital ulceration, however, the role of causative agents of other STIs, such as *Treponema pallidum* and *Haemophilus ducreyi* should not be forgotten. Occasionally HSV and *T. pallidum* can be recovered from the same lesion [9,10]. Non-infectious causes of genital ulceration, such as inflammatory bowel disease (Crohn disease), mucosal ulcerations associated with Behcet syndrome or fixed drug eruption, may also be confused with genital herpes [9]. The types of persons who are recommended to be tested for genital herpes infections are listed in Table 3.

Table 4

Recommendations for sample collection for the diagnosis of genital herpes infections

Specimen type or collection site	Tools for sample collection	Collection method
Male skin or mucous membrane lesions	• Sterile needles • Sterile cotton-wool or Dacron swab on a wooden, plastic or aluminium shaft • Microscope slides	• Open the vesicles with a sterile needle. • Collect the content of the vesicles with a swab and: ○ apply to a microscope slide (for immunofluorescence staining) or ○ introduce into transport media for viral culture or NAATs.
Male urethra	Sterile cotton-wool or Dacron swab on a wooden, plastic or aluminium shaft	• Clean the external urethral opening region with a swab moistened in saline. • Draw back the prepuce to avoid contamination when sampling. • Insert a cotton-wool or Dacron swab carefully into the external urethral meatus (to a depth of 0.5–2 cm) and collect urethral exudates for testing.
Female skin or mucous membrane lesions	• Gauze and cotton swabs • Microscope slides	As for male skin or mucous membrane lesions.
Female urethra	• Sterile gauze swab (to remove excess discharge) • Sterile cotton-wool or Dacron swab on an aluminium shaft	• Clean the introitus using a sterile gauze swab. • Carefully insert a cotton-wool or Dacron swab on an aluminium shaft into the urethra (to a depth of 0.5 cm) to collect exudates for testing.
Cervix	• Vaginal speculum • Sterile gauze swab • Sterile cotton-wool or Dacron swab on a wooden or plastic shaft	• Insert the vaginal speculum, which may be moistened in advance with warm water and clean the cervical canal opening thoroughly with a sterile gauze swab. • Insert a cotton-wool or Dacron swab carefully into the cervical canal (to a depth of 2 cm) and collect the material from lesions.
Vagina (of prepubertal girls)	Cotton-wool or Dacron swab on an aluminium shaft	Insert a cotton-wool or Dacron swab on an aluminium shaft carefully through the hymen into the vagina and collect the material from the back wall of the vagina.
Urine	Sterile container for urine	Ask the patient to collect the first 10–20 ml of voided urine (first catch). Note: patients should avoid urinating for least two hours before sampling.
Conjunctiva	• Sterile cotton-wool or Dacron swab on wooden, plastic or aluminium shaft • Kimura platinum conjunctival scraper • Topical ophthalmic local anaesthetic	• If there is purulent discharge, it must be removed with a cotton-wool swab. • Move a swab over the conjunctiva of the inferior eyelid towards the interior angle of the eye (use a thin swab on an aluminium shaft for newborns). • The Kimura scraper is used to sample the bases of lesions (either ulcers or the bases of burst vesicles). Before collecting the sample, the spatula is sterilised by heating in a flame and allowed to cool.
Rectum[a]	• Rectal speculum or proctoscope • Sterile cotton-wool or Dacron swab on a wooden or plastic shaft	• Rectal material is taken under direct vision, with the aid of a proctoscope or rectal speculum. Use of a blind technique results in considerable loss of sensitivity. • Insert a swab on a wooden or plastic shaft to a depth of 3 cm and collect the material from all rectal walls by circular motions for 10 seconds. Note: if faecal material is impacted, the swab should be discarded and the sampling procedure repeated.

NAAT: nucleic acid amplification test.

[a] Material from the rectum is collected when the patient has had anal sexual contact, there are inflammatory changes, or if perianal skin or anal folds are thickened.

The guidelines presented here represent the first attempt to introduce an evidence-based approach to the laboratory diagnosis of genital herpes infections in eastern Europe. It is recognised that national adjustments to these guidelines may be needed in some eastern European countries to meet local laws and health strategies and according to the availability of kits and reagents. They are a consensus document of the Eastern European Sexual and Reproductive Health (EE SRH) Network [11,12] and comprise one element of a series of guidelines aimed at optimising, standardising and providing guidance on quality assurance of laboratory testing for reproductive tract infections [13-16]. They are primarily intended for professionals testing specimens from patients at sexual healthcare clinics but may also be helpful for community-based screening programmes.

Methods for laboratory diagnosis of genital herpes

Laboratory confirmation of the clinical diagnosis is necessary for estimating the potential infectivity during episodes of lesions, identifying persons at risk of transmitting infection subclinically, selecting women at future risk of transmitting the infection to the neonate and confirming the clinical diagnosis in those for whom antiviral therapy for HIV infection should be prescribed [8].

Methods used for the diagnosis of HSV could be divided into direct detection of virus in material from lesions and serological diagnosis. Both virological detection and type-specific serological tests for HSV should be available in clinical settings that provide care for patients with STIs or those at risk for STIs.

The recommended sampling sites and type of sample and methods to be used for the diagnosis of genital herpes infection are presented in Table 4.

The recommendations for sample transportation for testing using microscopy, culture and NAATs are presented in Table 5.

The recommended sites and methods to be used for the diagnosis of genital herpes infection are presented in Table 6.

Microscopy

General

Microscopic examination of lesion materials using Romanovsky staining is used by a number of laboratories in Eastern Europe [17]. This method, however,

Table 5

Recommendations for sample transportation, by type of test

Test method	Conditions	Comments
Microscopy	• If there is a need to save the material for more than 24 hours, the smear should be fixed with 96% ethyl alcohol for three minutes. • Each smear on a microscope slide should be placed in the transportation container and transported to the laboratory accompanied by the relevant documentation including the investigation method requested.	• If the rules of sampling and conditions of transportation of the biological material are not followed (e.g. slides are broken, unmarked or stuck together or there is no material on the slide), microscopy should not be carried out.
Viral culture	• Immediately after sampling the material must be placed in relevant transport medium, such as Eagle's medium with addition of antibiotics, or the medium validated for this purpose. • The material should preferably be transported to the laboratory on ice. • Material should not be kept for more than 24 hours at room temperature. • Accurately marked test tubes must be placed in a hermetic reservoir and transported to the laboratory accompanied by the relevant documentation including the investigation method requested.	• Herpes simplex virus is sensitive to both the temperature and to drying out, so failure to observe the transportation rules may influence the success of viral culture considerably, i.e. it is unlikely that the virus will be isolated or identified.
Antigen detection and nucleic acid amplification tests (NAATs)	Transport medium is usually provided by the manufacturer of the diagnostic system. If the sample transportation procedure is not described in the manufacturer's instructions or in-house test systems are used, transportation is performed as follows. • Clinical material placed, for instance, in transport medium should be transported in the cold only (e.g. in a cool bag at 6 ± 2 °C). • Urine should be delivered to the laboratory within three hours of collection, at ambient temperature. Test tubes containing clinical material should be transported to the laboratory accompanied by the relevant documentation including the investigation method requested.	• The material is delivered in special test tubes with transport medium according to the manufacturer's instructions for each test. • Frozen (–70°C), specimens to be tested using NAATs may be kept for up to three months. However, storage conditions must be in line with the recommendations of the manufacturer of the NAAT.

NAAT: nucleic acid amplification test.

as well as cytological examination using Tzanckand Papanicolaou smears, have been found to have low sensitivity and specificity, and therefore should not be relied upon for diagnosis [5,9,18].

Antigen detection

General

Viral antigen from swab specimens can be detected using either direct immunofluorescence (DIF) or enzyme immunoassay (EIA). Commercial diagnostic tests produced in eastern European countries for the detection of herpes-specific virus antigen have not been validated against any international standard test; therefore the data presented below reflect characteristics of tests produced in western countries.

Direct immunofluorescence

DIF could be classified as a rapid diagnostic test allowing type differentiation of genital herpes viruses [19,20]. It can be valuable when testing high-prevalence populations [21], but when testing asymptomatic patients, the sensitivity may drop to less than 50% when compared with culture [19,21]. The disadvantages of DIF are that it is time consuming, labour intensive and, compared to NAATs, has a suboptimal sensitivity.

Antigen capture enzyme immunoassays

The sensitivity of commercially available EIAs, when compared with that of viral isolation, is greater than or equal to 95% and with specificities ranging from 62% to 100% for symptomatic patients [22-27]. The sensitivity of antigen capture EIAs may be higher than that of virus culture for typical presentations, but lower for cervical and urethral swabs [22-24,27]. Most commercially available assays, however, do not differentiate between serotypes.

Viral isolation in cell culture

General

Virus isolation in cell culture has been the cornerstone of HSV diagnosis over the past two decades in laboratories of western Europe [28,29] and the United States [30]. Although HSV can be isolated from over 90% of vesicular or pustular lesions, the isolation rate from ulcerative lesions is only 70% and falls to 27% at the crusting stage [4]. Delayed transport of samples to the laboratory and lack of refrigeration during transportation substantially affect the outcome of the testing [31]. The characteristic cytopathic effect of HSV in tissue culture generally appears within 24–72 hours, but may take up to five days.

Virus isolation in tissue culture roller tubes is slow and labour intensive, but has the advantage of demonstrating active infection within a clinical lesion and also allows virus typing and antiviral sensitivity testing [32]. More rapid culture of HSV can be achieved by using shell vials [33] or multiwell plates [34] and centrifuging the specimen onto cell monolayers on coverslips. Commonly used cells include primary human fibroblasts and cell lines such as MRC-5, Vero cells, baby hamster kidney and rabbit kidney cells [35,36].

Typing of HSV using cell culture can be performed directly on infected cell cultures using fluorescein isothiocyanate (FITC)- or immunoperoxidase-labelled type-specific monoclonal antibodies by DIF or by testing the cell supernatant by nucleic acid amplification tests (NAATs), with specifically designed primers.

Storage of HSV isolates

Isolates of HSV may be stored in 0.2 M sucrose in 0.02 M phosphate-buffered saline pH 7.2 (2SP medium) at –70 °C or in liquid nitrogen.

Nucleic acid amplification tests

General

HSV detection using polymerase chain reaction (PCR) has been shown to be the test of choice in patients with genital herpes ulcers. The detection rates of the PCR assays were shown to be 11–71% superior to virus culture [30,31,37-39]. Furthermore, compared with traditional PCR, real-time PCR allows detection and typing of HSV in a single reaction tube, is faster (takes approximately two hours to perform), allows simplified conditions of performance and lowers the risk of

Table 6

Recommended sampling sites, type of sample and preferred diagnostic methods for genital herpes

Sampling site or type of sample	Preferred diagnostic method
Vesicular rash on skin and mucous membranes	Nucleic acid amplification test (NAAT) or antigen detection[a]
Urethra (male)	NAAT or antigen detection
Cervix/urethra (female)	NAAT or antigen detection
Conjunctiva	NAAT or antigen detection
Urine (men and women)	NAAT
Vulva/vagina (prepubertal girls), vagina (women after hysterectomy)	NAAT
Spinal cord fluid	NAAT
Venous blood	Serological assays[b], e.g. enzyme immunoassays (EIAs)[c]

[a] Viral culture is an additional method.

[b] For screening purposes, detecting newly acquired infections and diagnosis in persons who present without lesions or atypical lesions [31].

[c] For detection of type-specific herpes simplex virus type 2 (HSV-2) antibodies.

cross-contamination [37]. Use of NAATs for diagnosis of HSV also allows less strict sample transportation conditions, compared with those required for diagnosis by culture.

As in western Europe and the United States, there are no comprehensively validated and approved commercial NAATs available for detection of HSV in many eastern European countries. However, some NAATs for HSV detection have been developed and are available in eastern Europe, but have not been validated against their internationally acknowledged analogues.

Quality control

In each DNA extraction and subsequent analysis, an internal positive control – allowing detection of amplification-inhibited samples and controlling the quality of sample preparation – and a negative control are necessary.

Certified and registered reference panels comprising coded control specimens should ideally be used for intra- and inter-laboratory quality control. The use of specimen panels is standard for test system operation. These act as indicators of sensitivity, specificity and reproducibility, which are independent of the test systems used.

Serological tests

Serological tests detect antibodies to HSV in blood, which are indicative of ongoing latent infection. Both type- and non-type-specific antibodies to HSV develop during the first several weeks after infection and persist indefinitely. However, directly after infection there is a 'window' in which testing for antibodies will give a negative result. Serodiagnosis is useful for documenting newly acquired infections and for diagnosis in persons who present without lesions or with atypical lesions. Testing for HSV type-specific antibodies can also be used to diagnose HSV-2 infection in asymptomatic individuals [31,40], and other persons with undiagnosed HSV-2 infection. Whether genital herpes is caused by HSV-1 or HSV-2 influences prognosis and counselling. Up to 50% of first-episode cases of genital herpes are caused by HSV-1 [41], but recurrences and subclinical viral shedding are much less frequent for genital HSV-1 infection than genital HSV-2 infection [42,43].

Validation of diagnostic tests

General criteria for the validation of diagnostic tests have been published by the TDR diagnostics evaluation expert panel (TDR is a Special Programme for Research and Training in Tropical Diseases, sponsored by the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the World Bank and WHO [44]. The criteria are demanding and beyond the capacity of most individual groups. However, the minimum requirements for the validation of a new or modified test have also been published [45].

Summary

Older, classical tests can display cross-reactivity between HSV-1 and HSV-2 and even with varicella-zoster virus. During the past 20 years, a number of type-specific tests have been developed, the sensitivity and specificity of which have been evaluated to be approximately 97% and 98%, respectively [46]. Although the benefits of the serological assays (such as type-specific EISAs) include the possibility of automation and therefore simultaneous processing of a large number of samples at relatively low cost, they have a number of disadvantages that considerably limit their use in the diagnosis of genital herpes. Although the detection of HSV-specific IgM is theoretically useful to detect recent herpes infection in the absence of an IgG response, approximately a third of patients with recurrent genital herpes caused by HSV-2 have IgM responses; thus detection of IgM is a poor indicator of recent infection. Unfortunately, serological tests alone cannot inform the aetiology of a presenting genital lesion with any degree of certainty.

Recommendations

Where viral culture facilities exist, they should be maintained in order to detect the causative virus directly from skin and mucous membrane lesions. Where culture is not available, consideration should be given to the introduction of a NAAT for HSV. If NAATs are not available, antigen detection, namely DIF or EIA, could be employed, if high performance of those tests can be assured. HSV type determination is important to inform counselling and prognosis. Type-specific serology should be used for detecting asymptomatic individuals, testing pregnant women at risk of acquiring HSV infection close to delivery, men who have sex with men, and people who are HIV positive. Widespread screening for HSV antibodies should be discouraged. It is recommended that any non-validated diagnostic tests should be validated against a recommended, approved gold standard test.

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The field epidemiology manual (FEM) wiki: a collaborative eLearning online portal to be launched at ESCAIDE

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A field epidemiology manual (FEM) training resource, the FEM wiki project, has been developed to support the European Programme for Intervention Epidemiology Training (EPIET) and to serve as resource for any training in intervention epidemiology. The project (www.femwiki.com) is the result of a collaboration between a team of experts from the City ehealth Research Centre (CeRC) of the School of Community and Health Sciences (SC&HS) in London and the European Centre for Disease Prevention and Control (ECDC), and will be formally launched and opened to the public at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE) on 11-13 November 2010 in Lisbon, Portugal.

The aim of the FEM wiki project is to make the training manual available online using a collaborative Web 2.0 platform that takes advantage of user-generated input while simultaneously certifying the scientific content through an editorial and review process. An editorial board consisting of field epidemiology experts has been established to convert the existing single document chapters, created by EPIET trainers, scientific coordinators and facilitators, into a set of hyperlinked wiki pages, each describing key epidemiological concepts. The training structure of the original chapters is preserved, and linked to a set of fora that support commenting and discussion.

The portal structure ensures the ECDC-recognised peer-reviewed content, approved by the editorial board, is available alongside user-generated and organically expanding pages.

The aim is to gather resources and to offer a collaborative space for creation of training material with a diversity of formats and to provide a meeting point for opinions. The target audiences include the EPIET community; the wider field epidemiology training community, the European Public Health Microbiology Training Programme (EUPHEM) fellows and anyone working in disciplines related to epidemiology.

The vision for the portal is that it will serve as key resource for training delivered by ECDC and will attract a large online community of experts, expanding the content to establish it as the key online resource for epidemiologists around the world.