

Rapid communications

MEASLES OUTBREAK IN SWITZERLAND - AN UPDATE RELEVANT FOR THE EUROPEAN FOOTBALL CHAMPIONSHIP (EURO 2008)

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Since November 2006, Switzerland has been experiencing the largest measles outbreak registered in the country since the introduction of mandatory notification for this disease in 1999. The first eight months of this outbreak have already been described in this journal [1]. From November 2006 to 13 February 2008, 1,405 measles cases were reported by physicians or laboratories in Switzerland (1,106 of them in 2007). Of these, 976 cases (69%) occurred in the cantons of Lucerne (29% of the total), Basel-Land (16%), Zurich (11%), Bern (7%), and Aargau (7%). The incidence for the whole country and all ages, calculated for this 15-month period, was 19 cases per 100,000 inhabitants (15 cases per 100,000 for the year 2007). For children under the age of 16 years living in the canton of Lucerne, it was 500 per 100,000.

Outbreak description

The ongoing outbreak began among school-age children in the canton of Lucerne. Its origin remains unknown. The disease then spread progressively to all Swiss cantons, with large differences in incidence rates and a great variety of settings (Figures 1 and 2). Measles virus (MV) of genotype D5 was detected in saliva or throat swabs from 56 patients living in 10 cantons. Most of the MV sequences obtained from these cases were identical, and some showed only one or two nucleotide differences from the major variant. The first sample was taken in November 2006 in the canton

of Lucerne, while the last was collected in November 2007 in the canton of Basel-Land. In addition, one genotype A-related vaccine virus was found in a woman vaccinated post-partum with the measles/mumps/rubella (MMR) vaccine and presenting 13 days after vaccination with a typical measles rash. B3 virus was isolated from two cases who had recently been abroad. One had returned from Italy four days prior to rash onset, the other from Ethiopia two days prior to onset of symptoms.

The monthly number of cases has increased steadily from November 2006 to a first peak in August 2007 with 170 reported cases (Figure 3). The number of cases then decreased to a minimum of 60 in December before reaching a second peak in January with 233 cases. Since October 2007, most cases were registered in the cantons of Basel-City and especially Basel-Land in northern Switzerland (64% of total cases since the beginning of 2008).

About half of the cases (693 or 49%) have been confirmed, either by detecting measles-IgM antibody or the measles virus RNA by RT-PCR (555 or 40%), or by an epidemiological link with a laboratory-confirmed case (138 or 10%). Due to the increasing proportion of cases who have not provided a sample for laboratory testing or information about an epidemiological link, these proportions have decreased since the first half of the outbreak, whereas the

FIGURE 1

Cumulative measles incidence rate and number of cases reported through the national mandatory notification system, by canton, Switzerland, November 2006 to 13 February 2008 (n = 1,405)

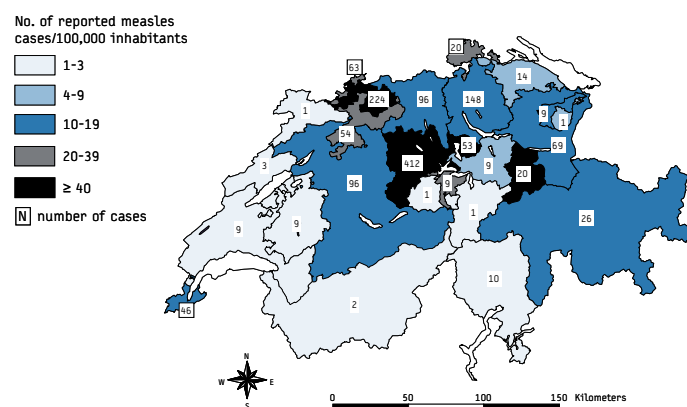
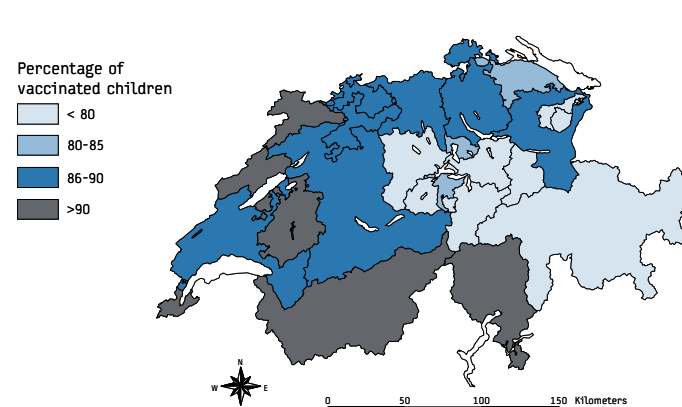


FIGURE 2

Cantonal vaccination coverage of two-year-old children with a first dose of measles/mumps/rubella or measles vaccine, Switzerland, 1999-2006 (data from last available cantonal survey)



proportion of cases fulfilling only the clinical case definition (fever and rash, as well as cough or rhinitis or conjunctivitis) has increased to 43%. The proportion of cases for whom clinical data are not yet available or who did not completely fulfil the case definition has remained unchanged (8%).

There has been a slight majority (51%) of males among the cases (Table). The patients' median age has been 11 years. The median age has increased recently: in late 2006 and 2007, 29% of the patients were 15 years old or older, compared to 53% since the beginning of 2008. The incidence rate was highest in the five- to nine-year-old group. Six percent of the 1,319 cases with detailed information were vaccinated against measles, 85% were unvaccinated, and the vaccination status of the remaining 8% was unknown.

The proportion of vaccinated patients has been low for all ages (Figure 4). There were 104 cases (8% of 1,319 cases for

whom information about hospitalisation and complications were available) who required hospitalisation. Six cases were reported with encephalitis or suspicion of encephalitis (0.5%), all among children. No deaths have been reported.

Control measures

In Switzerland, the cantons are responsible for outbreak control measures. Various measures were implemented by the cantonal medical authorities in response to this ongoing outbreak, including targeted and general information for the public, contact tracing, recommendation to complete immunisation if necessary (two MMR doses for people without proof of immunity born after 1963), and exclusion from school for non-immune siblings of cases [1]. To our knowledge, no supplementary immunisation activity has been organised specifically in response to the outbreak, and it is not known to what extent the recommendation to carry out catch-up vaccinations has been followed. The nature and intensity of the measures taken has also varied between cantons.

FIGURE 3

Epidemiologic curve of the measles outbreak in Switzerland, September 2006 to 13 February 2008, by canton (mandatory notifications, n=1,406)

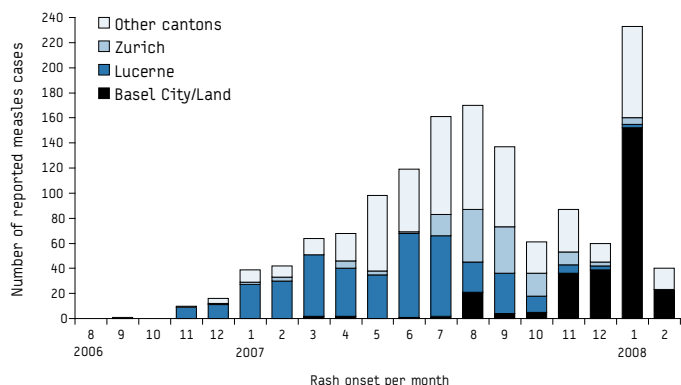
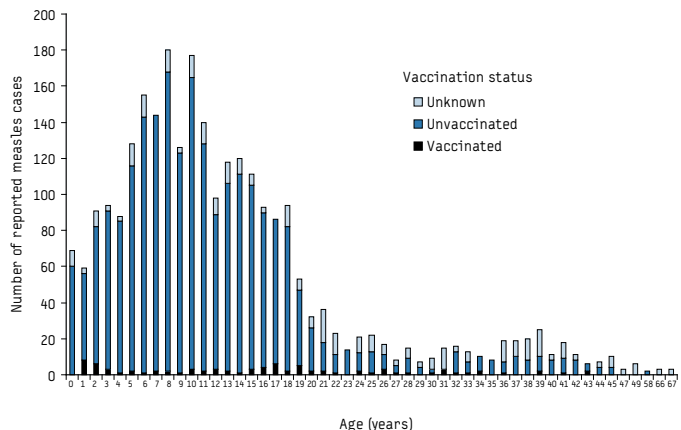


FIGURE 4

Vaccination status by age of measles cases reported in Switzerland between November 2006 and the 13th February 2008 (mandatory notifications, n=1,313)



TABLE

Descriptive epidemiology of measles cases reported in Switzerland between November 2006 and the 13 February 2008 (n=1,405)

Epidemiological characteristics	Category	No. of cases	%	IR*
Total cases		1,405	100.0	19.0
Sex	Male	714	50.9	19.4
	Female	688	49.1	18.0
	Unknown	3		
Age groups (years)	< 1	35	2.5	47.9
	1 - 4	175	12.5	59.7
	5 - 9	374	26.8	96.3
	10 - 14	339	24.3	79.2
	15 - 19	240	17.2	53.7
	20 - 29	107	7.7	11.7
	30 - 39	85	6.1	7.7
	≥ 40	42	3.0	1.1
Vaccination status**	Unknown	8		
	Vaccinated	84	6.4	
	1 dose	60	4.5	
	≥ 2 doses	20	1.5	
	unknown no. of doses	4	0.3	
	Unvaccinated	1,124	85.2	
Hospitalisations**		111	8.4	
Pneumonia**		104	7.9	
Otitis media**		63	4.8	
Encephalitis**		62	4.7	
		6	0.5	

* Incidence rate per 100,000 inhabitants

** Calculated for 1,319 cases with detailed information

Discussion

This ongoing nationwide outbreak of measles in Switzerland is characterised by its long duration (15 months to date), a peak in the summer, its spatial heterogeneity in incidence, and a high incidence compared to other European countries. The outbreak has mainly affected unvaccinated children of school age, but also unvaccinated young adults. Transmission occurred primarily in families and schools.

The unusual length of this outbreak is probably the result of the proportion and distribution of susceptible persons in the population, allowing the infection to spread gradually without necessarily leading to a rapid exhaustion of the pool of susceptible individuals. The national measles vaccination coverage of 86% for the first dose at the age of two and of 70% for the second dose (introduced in 1996) seems to be high enough to prevent an explosive and large outbreak of shorter duration. However, it is not sufficiently high for an interruption of sustained MV transmission with only minimal control measures. Moreover, vaccination coverage stagnated at around 82% between 1991 and the beginning of this decade, allowing for the accumulation of a large number of susceptible individuals.

As suggested in Figure 3, a detailed analysis of the temporal and geographical distribution of cases shows that this large national outbreak is broken down into successive local and regional clusters with partial overlap. Due to insufficient vaccination coverage combined with a high heterogeneity between the cantons (from 69% to 94%) and due to the time elapsed since the last large outbreak in 2003 that had about 700 reported cases, measles virus can progressively spread to new regions, in particular among communities of people preferring alternative medicine and education methods (homoeopathy and anthroposophy). The circulation of the same genetic variant of MV since November 2006 indicates a single nationwide outbreak. This imported D5 MV has its origin in South-East Asia and has been continuously transmitted within Switzerland over a period of at least 15 months. It can therefore be considered as "newly endemic" at present.

Such a long outbreak or successive outbreaks of short duration are not unusual in settings where unvaccinated individuals accumulate over time due to poor uptake of vaccine. In 1999–2000, the Netherlands experienced an almost year-long measles outbreak with about 3,300 cases, which started among unvaccinated individuals in areas with low vaccination coverage; however, there was only sporadic spread to communities with high vaccination coverage [2]. A very large outbreak raged in Italy in 2002 and again in 2003, after a few quiet months [3]. Bolker and Grenfell have hypothesised that an intermediate vaccination coverage could decelerate the timing of regional outbreaks in the same country [4], with a consecutive extension of the total duration of the outbreak. Measles elimination (interruption of endemic disease transmission) has been achieved in countries that have a sustained high coverage with two doses of measles vaccine [5,6].

In areas where it remains endemic, measles is considered a seasonal disease with epidemic peak usually in late winter or early spring. Its temporal pattern seems to be influenced by school holidays, even after the introduction of measles vaccination [7]. The dry indoor humidity could also explain the peak during the cold season in the northern hemisphere [8]. Surprisingly, the current outbreak began in mid-autumn, a period that usually has a very low

incidence in Switzerland, and peaked during July to September, although the number of cases usually sharply decreases after the spring peak. Despite the summer closure of schools, 56% of patients were of school-age during that period.

Figure 1 shows that most cases were concentrated in north, east and central Switzerland, with a relatively low incidence in the western and southern part of the country, corresponding to the French- and Italian-speaking region. The incidence was only three per 100,000 in this region compared to 26 per 100,000 in the German-speaking region, with vaccination coverage of about 92% and 85%, respectively. However, the correlation between measles vaccination coverage and the incidence rate remained moderate at a cantonal level.

Switzerland has endorsed the goal to eliminate indigenous measles and rubella in the European Region of the World Health Organization (WHO EURO) by 2010 [9,10]. Nevertheless, Switzerland experienced the highest measles incidence rate of central and western Europe for 2007, with 15 cases per 100,000 inhabitants. According to EUVACNET reports [<http://www.euvac.net>], during the first three quarters of 2007 Switzerland notified 29% of all measles cases from the 32 European countries that report to EUVAC.net, and as many as 42% for the third quarter alone. It thus constitutes a potential source of imported measles for other countries in Europe and elsewhere. Importations have already been reported in Germany, causing an outbreak in Lower Bavaria [11], in Denmark (one sporadic case), in England (two sporadic cases), and in the United States (three imported cases in 2007 and one in 2008 that has led to an outbreak in a community with a high (circa 10%) level of exemption from school vaccination requirements due to personal beliefs [12]). The Swiss federal office of public health urges unvaccinated Swiss people born after 1963 to receive two doses of an MMR vaccine and invites foreign visitors to be vaccinated before travelling in Switzerland. This recommendation is particularly important for people intending to visit large events such as the European football championship (EURO 2008) in June.

*Erratum

In Figure 2 of this article, the area representing the canton of Basel-City was mistakenly left in white instead of dark blue. This was corrected on 26 February 2008.

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