# An outbreak of measles in orthodox Jewish communities in Antwerp, Belgium, 2007-2008: different reasons for accumulation of susceptibles

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From August 2007 to May 2008, an outbreak of at least 137 cases of measles occurred in some orthodox Jewish communities in Antwerp, Belgium. The outbreak was linked to outbreaks in the same communities in the United Kingdom and in Israel. The reasons for this outbreak were diverse: cultural factors, misinformation on vaccination by some medical doctors and the lack of a catch-up vaccination programme in private Jewish schools. The identification of smaller susceptible groups for measles transmission and vaccination of these groups represent a major challenge for the measles elimination programme.

## Introduction

Outbreaks of measles have been described in several European countries in 2007 and 2008. Travelling played an important role in several of these outbreaks. Roma populations and Irish travellers are some of the susceptible groups for measles transmission. Other susceptible groups identified in 2007 were orthodox Jewish communities [1,2].

These latter communities were also affected in an outbreak of measles in Belgium that occurred in Antwerp between August 2007 and May 2008 [3].

Measles vaccination in Belgium (trivalent measles-mumps-rubella (MMR) vaccine) has been offered free of charge since 1985 through the routine childhood immunisation programme (first dose at the age of 12 months) and through school health centres (second dose at the age of 10-13 years since 1995 and catch-up vaccination for both doses). Following the introduction of routine immunisation, the incidence of measles in Belgium has decreased from 998 cases per 100,000 inhabitants in 1982 to six cases per 100,000 in 1999 [4]. The national incidence of measles in Belgium in 2006 was estimated at between five and 10 cases per million inhabitants, based on data reported by a voluntary surveillance network of paediatricians and general practitioners (GPs), a laboratory network and mandatory notification of measles cases in schools [5]. The current surveillance of measles does not allow estimating incidences per province, but since 2002, only sporadic cases of measles have been notified in Antwerp.

Overall vaccine coverage for the first dose of measles vaccine (MMR1) in Antwerp is 94% according to a vaccine coverage study in children aged 18-24 months in 2005 [6]. Separate information on measles vaccine coverage in particular groups such as Jewish communities in Belgium is not available.

Antwerp is home to several Jewish communities, all residing in the same part of town. Orthodox Jewish communities are very isolated, with children going to Jewish schools.

In October 2007, a school health service in Antwerp reported several suspected cases of measles in two Jewish schools in the city. The objectives of this study were to describe the outbreak and to identify reasons for non-vaccination and accumulation of susceptible communities in Antwerp, in order to implement control measures and prevent outbreaks in the future.

## Methods

Investigation of the cluster was carried out by the Public Health Surveillance of Flanders, in collaboration with the Scientific Institute of Public Health (IPH). Cases were reported by school health services in Antwerp (mandatory notification), by paediatricians and GPs (voluntary notification), through the Jewish communities (after an awareness campaign) and by the national laboratory for measles and rubella (IPH).

All cases that met with the clinical case definition of measles (rash and fever and at least one of the following symptoms: coryza, cough or conjunctivitis) and were either member of a Jewish community or had an epidemiological link with a case associated with the outbreak, were included. The diagnosis of measles was confirmed on saliva and nasopharyngeal samples (IgM and/or PCR) on as many cases as possible. Genotyping was performed by the national laboratory for measles and rubella (IPH) and the World Health Organization (WHO) regional reference laboratory in Luxembourg.

Epidemiological data were collected through a structured questionnaire, administered by the outbreak investigation team to cases or their parents, during a house visit or a phone interview.

Patients or their parents were questioned on demographical data, clinical data, contact with other patients, stay abroad and vaccination status (validated when possible by vaccination card). The electronic vaccination database of Flanders (Vaccinnet) was used to complete missing information on the vaccination status (for all cases).

## Results

At least 137 cases of measles were identified in this outbreak between August 2007 and May 2008. The questionnaire was filled in for 128 cases (93%).

Epidemiological investigation indicated that the two first cases of measles, two children belonging to an orthodox Jewish community, had attended a summer camp in the United Kingdom (UK) (Figure 1). Both fell ill on their return. Further spread among ultra-orthodox Jewish communities may have been reinforced at different moments, as the outbreak points out, with possible re-importation of the virus from the UK and from Israel.

Almost all cases of the outbreak (96%) lived in the same neighbourhood in Antwerp, and 129 cases (94%) belonged to orthodox Jewish communities.

The age distribution for the measles cases is presented in Figure 2. The majority of cases (81%) were younger than 10 years of age. Of the 16 children that were under 12 months of age, three (19%) were between three and six months-old, seven (44%) were between six and nine months-old and six (37%) were between nine and 11 months-old. Two children (one four and one 11 months-old) were infected by their mother. Half of the non-Jewish cases were adults. 71 of 135 cases (for whom sex was known) were male. Complications (otitis, bronchitis, pneumonia) occurred in 14% of cases and 7% were hospitalised (n=130 for whom the information was available).

The diagnosis of measles was confirmed for 27% of cases. Genotyping was performed on 25 samples (18%) (Figure 1). The virus isolated was of genotype D4.

Data on vaccination status was collected for 129 measles cases (94%), of whom 28 children (22%) were vaccinated with one dose of measles containing vaccine, according to their parents. However, this information could only be validated for 15 children (12%). Of the 101 unvaccinated cases (according to the parents), 78 (77%) were eligible for vaccination according to their age.

For 69 (88%) of these cases, information on the reason for non-vaccination could be collected. Reported reasons were: 'on advice of the GP or paediatrician' for 26 cases (38%), 'by omission' for 18 cases (26%), and 'out of fear of side-effects, allergy or frequent disease in childhood' for 16 children (23%). Opposition to vaccination as reason for non vaccination was reported for only nine cases (13%), representing three families (5% of all Jewish families involved in the outbreak). 56% of the non vaccinated eligible cases were patients of the same GP, known to be opposed to vaccination. None of the families mentioned religious beliefs as reason for non-vaccination.

The majority of cases (40%) in this outbreak were identified by active case investigation and contact tracing. Mandatory notification in schools identified 21% of cases, although 67% of cases were school-aged children. The other cases were reported by the national laboratory for measles (19%), the Jewish communities (12%) and paediatricians and GPs (8%). Percentages pertain to the initial source of information.

## Control measures

Awareness among the Jewish communities was raised through publications in a local paper (in Yiddish and in Flemish), with the help of Jewish doctors, rabbis and a Jewish health organisation. GPs and paediatricians in Antwerp were informed about the outbreak and invited to perform laboratory testing (on saliva) for confirmation of the diagnosis in suspected measles cases, to report the cases to the division of infectious disease control of at the Public Health Surveillance of Flanders and to check the measles vaccination status of all patients.

In response to the notification of the first measles cases in October 2007, vaccination was offered by the school health service to non-vaccinated children in the two affected subsidised Jewish schools in Antwerp. As the epidemic continued in spring 2008, a second vaccination campaign was carried out in May 2008 in all subsidised Jewish schools. Setting up a catch-up vaccination campaign in private Jewish schools was more difficult and time consuming, and took place in June 2008. Although no recent cases had been identified, about 500 school aged children were

FIGURE 1

**Epidemic curve of measles cases from the outbreak in Antwerp, August 2007-May 2008 (n=133 cases with known date of onset)**

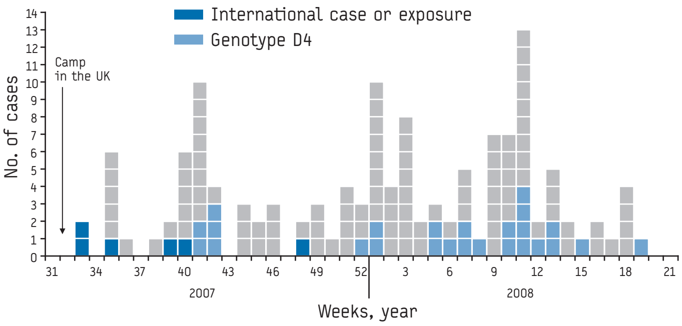
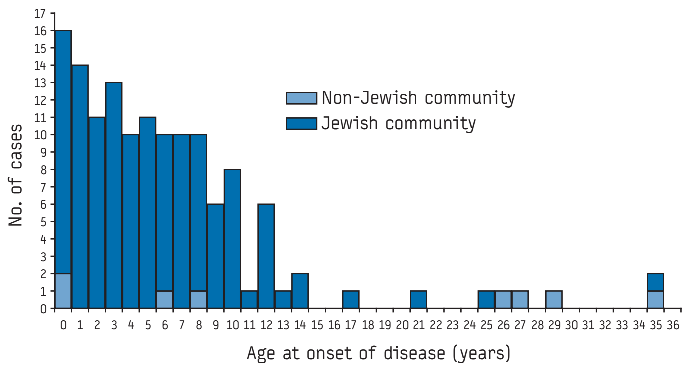



FIGURE 2

**Age distribution of measles cases from the outbreak in Antwerp, August 2007-May 2008 (n=137)**



vaccinated, to avoid new import of measles during the summer holidays by the remaining susceptible children.

## Discussion

Similar to other culturally closed communities such as Roma and Irish travellers, orthodox Jewish communities belong to the group of hard-to-reach populations identified in Europe, as contact with "outsiders" is regarded with suspicion. Building up contact with representatives of these communities took time, but once established, investigation and control activities were carried out with their support.

As measles is not a mandatorily notifiable disease, some doctors refused to report cases. It is therefore likely that some cases were not identified. Nevertheless, active case finding through house visits allowed the description of the outbreak, and parents of cases collaborated well, which resulted in a high response rate to the questionnaires.

The virus strain circulating in Antwerp (D4) was of the identical genotype as the strain responsible for the outbreak in Jewish communities in the UK [1] and in Israel [2]. Although D4 strains have recently been implicated in major outbreaks in Europe [7,8] and information on circulating genotypes in Belgium or Antwerp before the outbreak is not available, it is most probable that the virus was imported from the UK.

Transmission of the virus within the Jewish communities occurred mainly at school, with further spread to the non-protected younger siblings at home. The high MMR1 coverage in the general population and the socially isolated way of life of ultra-orthodox Jewish communities avoided spread of the outbreak to the whole town or country. In total, only eight non-Jewish individuals were infected with measles during this outbreak. Except for two vaccinated children, the affected non-Jewish cases were either too young or too old to have taken part in the routine vaccination programme. Transmission to non-Jewish individuals occurred in the neighbourhood, through work or in the waiting room for paediatric consultation at a hospital in the area. Non-Jewish adult cases were initially diagnosed as having an allergic rash in response to antibiotics prescribed for a supposed respiratory tract infection.

The outbreak investigation highlighted that there were no religious reasons for opposition to vaccination. Similar to findings of a qualitative study among the orthodox Jewish community in London, many families had partially immunised their children [9]. Cultural factors (routine vaccination schedule started later and with a longer interval between vaccines, large families with omission of vaccination for one or two children) and lack of information or misperception of possible side effects or interaction with other diseases were important reasons why children did not get a first dose of MMR vaccine during their childhood. In subsidised schools where follow-up of health and vaccination status is provided by public health services of school medicine, catch-up vaccination is offered to the children at each of their regular consultation appointments (every 2-3 years). Pupils of private schools that do not have a school health service are not offered (catch-up) vaccination and have to rely on their paediatricians and GPs for information on vaccines and for vaccination itself. The investigation revealed that two physicians in Antwerp, known to serve a high proportion of the orthodox Jewish communities, are advising mothers not to vaccinate their children. Within families, the index case of measles was generally infected at (primary) school. Early catch-up vaccination for the first dose of MMR in schools, and systematically offering the second dose of MMR, not only in subsidised schools but also in private schools might have avoided this outbreak.

None of the measles cases in the outbreak was vaccinated with two doses of measles-containing vaccine, highlighting the importance of giving a second dose of vaccine.

Because of the outbreak and the vaccination campaigns, we can expect that all the individuals that had been susceptible to measles in these communities are now protected – through natural disease or vaccination. To avoid new accumulation of susceptibles, an agreement must be found to offer the routine childhood vaccines to pupils of private schools that do not yet have a school health service.

## Conclusion

Very diverse reasons have led to an accumulation of people susceptible to measles within part of the population in the centre of Antwerp. The nature of social behaviour in Jewish communities, with frequent travelling and lots of international contacts, led to the importation of measles among these susceptibles, leading to an outbreak of at least 137 cases.

The orthodox Jewish communities were previously not identified as a risk group for measles transmission in Belgium. Other unidentified groups may exist.

The identification of smaller susceptible groups for measles transmission and systematic vaccination of these groups represent a major challenge for the measles elimination programme in Europe.


## Aknowledgements

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