Who Cares about Mumps? You Should!

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(See the brief report by Polgreen et al. on pages 1447–9)

Until the 1970s, mumps was one of the most common pediatric infectious diseases. Childhood mumps, which most often manifested as fever and bilateral parotitis, was generally not very severe but could result in meningoencephalitis, and in adult men, it could lead to painful orchitis. Fortunately, this latter complication was generally unilateral and rarely led to decreased fertility [1].

With the advent of a live, attenuated mumps virus vaccine in 1967, there was a very rapid decrease in the number of mumps cases, such that only 266 cases were reported to the Centers for Disease Control and Prevention (CDC) in 2001. Along the way to what seemed like total elimination of the disease, there were occasional resurgences in mumps cases, such that only 266 cases were reported to the Centers for Disease Control and Prevention (CDC) in 2001.

Along the way to what seemed like total elimination of the disease, there were occasional resurgences in mumps cases, primarily among teenagers and young adults who had gone through primary school before the mandate for childhood immunization with the trivalent measles, mumps, and rubella (MMR) vaccine. This resurgence was thought to occur primarily among persons who had received an earlier killed virus vaccine preparation or who had not been vaccinated during childhood, either because of family religious beliefs or because the threat was, by that time, deemed to be so minor that vaccination did not seem to be necessary. The unvaccinated population had presumably escaped earlier infection because of herd immunity and the resultant paucity of opportunity for exposure to the wild-type virus. High school and college immunization programs were instituted, and again the incidence of mumps plummeted.

However, during the winter-spring of 2006, an outbreak originally involving 219 people occurred in the United States, with its epicenter in Iowa, where, up to that time, the average annual number of reported cases reported was 5 [2]. The outbreak that started in Iowa spread to 45 other states and ultimately involved almost 5800 confirmed or probable cases in the subsequent 10 months [3]. Air travel was implicated as an important element in the breadth and rapidity of infection transmission [4]. The strain of mumps virus isolated was found to have the same genotype (genotype G) as that which had caused a major outbreak in the United Kingdom the previous year that had involved ~56,000 patients, primarily young adults.

Since 1977, Iowa had mandated that 1 dose of MMR vaccine be given to all children entering school. In 1991, the requirement was increased to 2 doses, and in 2004–2005, 97% of children who entered Iowa schools had received 2 doses of MMR vaccine. In this outbreak, as in the one in the United Kingdom, the majority of cases involved young adults (mean age, 21 years). In addition—and this is of great concern—51% of the investigated patients had received 2 doses of MMR vaccine, and 12% had received 1 dose. Therefore, this epidemic was not the result of failure to vaccinate, but rather apparent vaccine failure.

Isolation is one of the prime tools used to curb the spread of mumps; therefore, information on the duration of shedding is crucial for development of isolation algorithms. In this issue of Clinical Infectious Diseases, Polgreen et al. [5]—some (and perhaps all) of whom were involved in the investigation of the Iowa outbreak of mumps—use virus culture results and clinical and immunological data from that event to identify confirmed and probable cases and to construct a logistic regression model for the duration of shedding of mumps virus after the onset of symptoms. The model estimates that viral shedding decreases with each day after the onset of symptoms and predicts that the percentage of patients who shed virus would be expected to be 11% on day 5 and 4% on day 9 after onset. Vaccination status does not significantly affect the model.

As the authors state, it is clear from
previous studies that mumps virus is shed by infected individuals for several days before the onset of symptoms. The duration of shedding after the onset of disease has been less certain, and recommendations for duration of isolation of infected patients to protect susceptible persons have varied from 5 to 9 days, on the basis of older observations. This first major outbreak in the United States in decades provided an opportunity to derive new data based on up-to-date mumps virus culture methods and IgM assays. Although, in the relatively small sample of patients tested, there were no positive viral culture results at day 9, the model predicts that some patients would still be shedding virus at this time. Because the population at risk appears to be larger than one would have expected on the basis of the prevalence of vaccination, prudence dictates adoption of the longer-duration isolation period. The CDC has adopted 9 days after the onset of parotitis as the duration standard for isolation of infected patients [3]. This recommendation may be particularly important for infected health care workers.

Although vaccination efficacy was not examined directly in this study, it is particularly troubling to note the very high percentage of infected people who had, in fact, received what should have been protective courses of mumps vaccination. Conventional wisdom has endowed both natural infection and immunization using live virus vaccines with the ability to confer life-long immunity. It is hard to believe that waning immunity did not play a role in the susceptibility of many of the people who were infected in this outbreak. There are 2 types of vaccine failure: primary and secondary. Primary failure denotes the lack of initial vaccine “take”; secondary failure is more complex and may represent either waning of immunity or a failure of vaccine protection in epidemic situations. The relatively advanced age of the majority of infected patients would also lend credence to a waning immunity hypothesis.

Outbreaks such as this may help inform revisions of vaccination recommendations, leading either to booster shots of current vaccines or, in the case of mumps, to use of other virus strains that may provide greater protection [6]. It is clear that more than 1 of these strategies may be required to ward off a number of infectious diseases in adults to which we thought we had life-long protection.

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References