

Mumps missive

"Boys, young men and men in their prime were affected—mainly those who frequented the wrestling school and the gymnasia."

Hippocrates, *Epidemics I*

Vaccination has reduced by more than 99% the annual numbers of mumps cases reported in the United States.¹ However, from 2016 through February 25, 2017, 6,388 cases of mumps were reported to CDC.^{1,2} During the same period, 47 cases have been reported in Oregon. Is this old scourge making a comeback? In this *CD Summary*, we review the latest epidemiologic trends and recommendations for control and prevention.

The illness

Although long a childhood nuisance, mumps gained notoriety from the epidemics it spawned among military troops. During World War I, mumps was a leading cause of days lost from active duty, with an average hospitalization rate exceeded only by those of influenza and gonorrhea.* During the prevaccine era, about 186,000 cases were reported each year in the U.S.¹; this was likely a gross underestimate, given typical underdiagnosis and underreporting. Before vaccines, mumps caused transient deafness in 4.1% of infected adults and permanent deafness in 1 of every 20,000 cases. It accounted for 10% of aseptic meningitis and 36% of encephalitis. Orchitis was reported in 11.6% to 66% of postpubertal males with mumps.³ Sterility occurred infrequently, although oligospermia and hypofertility could result, and an increased risk of testicular cancer has been reported after mumps orchitis.⁴ Oophoritis was reported in 5% of cases among postpubertal females; during one outbreak, mastitis was reported in 31% of them. Pancreatitis has been reported in 3.5%.

Maurice Hilleman: Father of modern vaccines

"On March 23, 1963 at 1:00 a.m., Jeryl Lynn Hilleman woke up with a sore throat... 'Daddy?' she whispered. Hilleman shook himself awake... and gently touched the side of his daughter's face. There, at the angle of her jaw, he felt a lump. Jeryl winced in pain.... 'Oh, my God,' he said, 'you've got the mumps.' Then Hilleman did something that few fathers would have done. . So he... stroked

* ...and that's saying something.

the back of her throat with the cotton swab, and inserted it into the vial of broth. Then he comforted her, drove back to work, put the nutrient broth in a laboratory freezer, and drove home.”⁵

Hilleman turned his 5-year-old daughter’s virus into a live, attenuated mumps vaccine, and ultimately combined his measles, mumps and rubella vaccines into a single shot, MMR, licensed in 1971.⁵

Dr. Hilleman, who might reasonably have been expected to win a Nobel Prize for the MMR vaccine,[†] instead was rewarded with hate mail and death threats.⁶

U.S. up to its ears

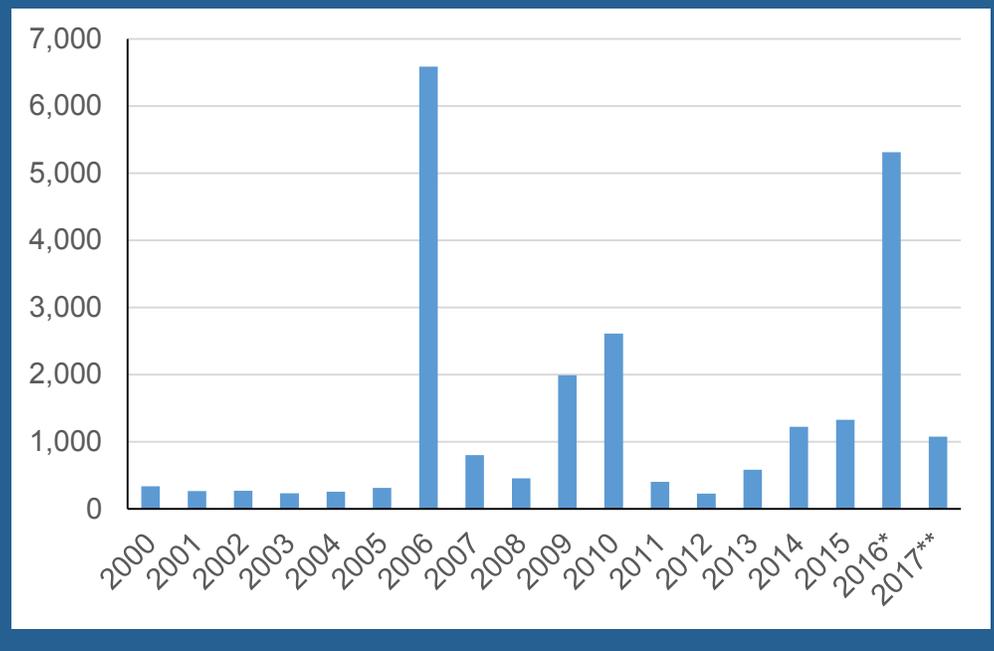
With widespread vaccination, case counts plummeted, but the disease was not eradicated. Since the year 2000, reported mumps cases in the U.S. have ranged from a couple of hundred to a few thousand per year (Figure 1).¹ Epidemics can occur even among highly vaccinated communities, as immunity from pre-school vaccination wanes.⁷ In 2016, 5,311 cases were reported to CDC,¹ mainly from outbreaks in Iowa (678 cases) and Arkansas (2,122 cases).² Both outbreaks arose in close-contact settings such as universities and close-knit communities.

In recent years, mumps has mostly struck adolescents and young adults. Through the eighth week of 2017, a total of 1,077 mumps cases were reported to CDC by 37 states; Arkansas reported 416 of them. The 15–24 year age group accounted for 35% of cases, followed by 5–14 (26%), 25–39 (21%) and 40–64

year-olds (13%). As usual, a disproportionate number of cases have occurred among the unvaccinated and partially vaccinated. Of the cases with known vaccination status, 26% received 0 doses, 8% had 1 dose, 47% received the recommended 2 doses, and 4% had 3 doses. National data lag behind reality especially in states swamped with cases. Our colleagues in Washington State tell us that they logged 421 cases during the first nine weeks of 2017.⁸

The recent outbreaks seem to be attributable to a combination of

Figure 1. Mumps cases, U.S., 2000–2017



*Preliminary case count as of December 31, 2016.

**Preliminary case count as of February 25, 2017.

† ...not to mention vaccines against chickenpox, hepatitis A, hepatitis B, pneumococcus, *Haemophilus influenzae* and meningococcal disease.

imperfect vaccine effectiveness, waning immunity, and intensity of exposure. College campuses, with large numbers of young adults many of whom are 13–18 years past their most recent MMR, congregating from disparate locales and living at close quarters, and perhaps engaging in behaviors that involve saliva exchange, such as kissing or sharing utensils, cups, lipstick or hookah, seem to promote viral prosperity.¹

Oregon

From January 2016 through March 8, 2017, 49 cases have been reported in Oregon — 36 of them from Marion and Washington counties (Figure 2). Clusters have occurred among Pacific Islanders, in a middle school, and among middle- and high-school wrestlers. Among 27 cases ≤ 19 years of age, 21 (78%) were up to date on vaccination; data for older age groups are not available.

New millennium mumps milder

Symptoms among cases in recent outbreaks have shown that among vaccinated persons, severe complications are generally uncommon and occur more frequently among adults than children. For example, the 2006 and 2009–2010 outbreaks demonstrated rates of orchitis among postpubertal males from 3.3%–10%, mastitis among postpubertal females from <1% to 1% and oophoritis from <1% to 1%. Reported rates of pancreatitis, deafness, meningitis and encephalitis were all <1%, and no fatalities were reported.³

Diagnosis

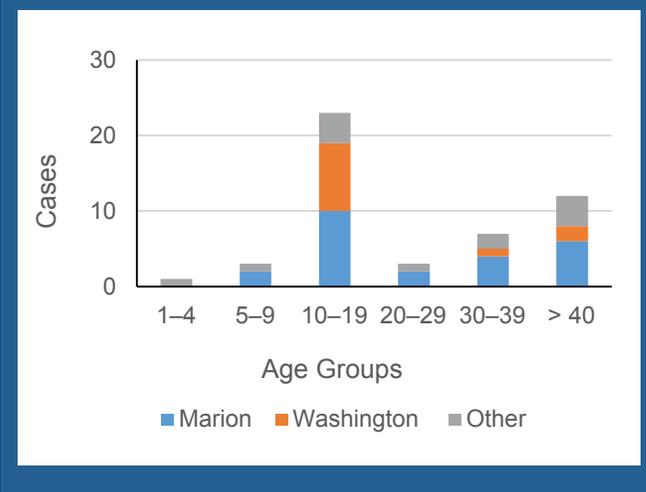
Collect both serum and a buccal swab from all patients with suspected mumps. Swab specimens are obtained by massaging the parotid gland area for 30 seconds before swabbing the area around Stensen's duct. Processing the swabs within 24 hours of collection will enhance the sensitivity of both RT-PCR and viral culture — the latter being the gold standard. Both tests lose sensitivity with time, so oral or buccal swabs are ideally collected within 3 days of parotitis onset.³

Mumps can be presumptively diagnosed by the presence of serum anti-mumps IgM antibody, but its sensitivity varies by vaccination status; it is 80%–100% in unvaccinated persons, 60%–80% in one-dose vaccine recipients, and only 13%–14% in two-dose vaccine recipients.^{9–11} On the other hand, RNA was detected in samples from 30%–71% of cases among two-dose vaccine recipients if the samples were collected within 3 days of parotitis onset.⁹

Vaccination

One dose of MMR is recommended for preschool-age kids ≥ 12 months old, and for adults born during or after 1957 not at high risk for mumps exposure. A second dose of MMR is recommended for school-age children and for adults at high risk for mumps exposure (e.g., healthcare personnel,

Figure 2. Mumps cases by age group, Oregon, 2016–2017



international travelers and students at post-high-school educational institutions). Adults born before 1957 are presumed to have earned their immunity the old-fashioned way and needn't be vaccinated.

Two doses of the vaccine are 88% (range, 66%–95%) effective in preventing mumps; one dose is 78% (range, 49%–92%) effective.¹ In a 2005 summer camp outbreak in upstate New York, attack rates among those receiving two, one, and no MMRs were 3.6%, 8.7% and 42.9%, respectively.¹²

A 2006 outbreak demonstrated that cases among university students were more likely than their roommates without mumps to have been vaccinated ≥ 10 years earlier, the odds of being a case increasing with each year since vaccination.⁷ In contrast, analysis of cases from a 2009–2010 secondary school outbreak found no association between time since most recent dose and mumps infection. Rather, intensity of exposure was predictive: the risk to students increased with increasing number of mumps cases in the class.¹³

Better off with vaccination than without it

If cases still occur among vaccinated persons, why get vaccinated? What if we just stopped vaccinating? It so happens that the experiment has been done. In 1993, MMR vaccine was withdrawn in Japan due to mumps vaccine-associated meningitis. Since then, mumps vaccination has been voluntary, and coverage dropped to 30%–40%.¹⁴ The consequence: in 2015, 81,046 cases of mumps were reported in Japan — a country with a population about 40% of the U.S.'s.¹⁵ This shows what happens even in a developed country when immunization rates sag. The vaccine isn't perfect, but perhaps 88% effectiveness is better than bupkis.

Globally, mumps will continue to be endemic, because vaccination against it is recommended in only 61% of countries.³ In Finland, with 95% MMR coverage since 1987, indigenous mumps has been eliminated.⁴ The recent outbreaks in the U.S. and Oregon indicate the need to maintain very high 2-dose vaccination coverage.

For more information

• Oregon Public Health Division mumps web page:

<https://public.health.oregon.gov/DiseasesConditions/DISEASESAZ/Pages/disease.aspx?did=49>

• CDC mumps page: www.cdc.gov/mumps/

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