Measles Resurgence in Taiwan—Lessons Learned

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Measles is one of the most contagious human diseases, and vaccination is the most effective way to prevent it. With high measles-mumps-rubella (MMR) vaccine coverage, the annual incidence of measles in Taiwan has decreased to less than 1/1,000,000 during 2003–2008.

However, three measles outbreaks linked to imported cases were reported during the period of November 2008 to February 2009 (Figure), resulting in 22 cases from five hospitals across Taiwan. All three index cases were in China during the possible exposure period. Of the 22 cases, the median age was 15.5 months (range, 8 months to 40 years). Only two cases received measles-containing vaccine: one received measles vaccine at 9 months and the other received MMR at 12 months. Nine (41%) were aged < 12 months, and were thus too young to be vaccinated; 10 (45%) cases were aged > 15 months and were not vaccinated with MMR; another two cases were born before the implementation of the national measles-containing vaccine vaccination policy. Of the 22 cases, 17 were nosocomially acquired. Among these, 82% were patients (the majority were inpatients and the minority were ER patients), while 12% were visitors to the hospitals and one was a health care worker.

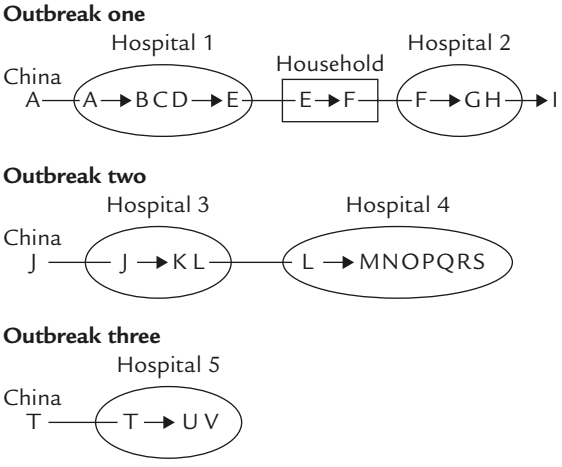

Figure. Chain of transmission in the three outbreaks, from November 2008 to February 2009 in Taiwan. Each of the letters A to V represents a confirmed case. The arrows represent transmission. Each oval indicates a hospital. Cases included in the same square were household transmission.

More than 2000 contacts of the above cases were identified. For those who had not been vaccinated, post-exposure prophylaxis, including administration of MMR within 72 hours after exposure for children aged ≥ 12 months, and intramuscular immunoglobulin (IMIG) within 6 days after exposure for children aged < 12 months,[1] were given. The efficacy of MMR vaccine as post-exposure prophylaxis ranged from 68% to 100% in previous reports.[2] In these outbreaks, more than 50 doses of IMIG were given to contacts. None of those who received IMIG developed measles.

The estimated reproductive number of measles is 12–18, which is much higher than the 2–3 for SARS.[3] Therefore, immunity prevalence of 93–95% in the population is required to achieve herd immunity to interrupt measles circulation in the community, according to WHO recommendation.[3,4] The seroprotection rate of first-dose MMR vaccine

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is 90–95% if given at 12–15 months of age.[4] In Taiwan, the vaccine coverage of first-dose MMR is 96%, which implies an unvaccinated population of about 36,000 children aged 12–72 months every year. The number of susceptible hosts is higher if 5% primary vaccine failure is taken into account.[5,6] Therefore, it is of vital importance to vaccinate children on time and minimize missed vaccination opportunities. Responding to the outbreaks, the Taiwan Advisory Committee on Immunization Practices (ACIP) changed the schedule for first-dose MMR from 12–15 months to 12 months in March 2008 to achieve better compliance. In addition, more aggressive mop-up measures for the hard-to-reach population have been implemented.

Furthermore, frequent international travel to endemic countries by Taiwan nationals puts Taiwan at risk of imported measles and its spread among susceptible population. The Taiwan Centers for Disease Control emphasizes that children should keep their vaccination up to date, particularly before entering endemic countries. If children are going to endemic countries before 12 months of age, the Taiwan ACIP recommends vaccination with measles vaccine for children aged ≥ 6 months. Because of the high failure rate of early immunization, revaccination after 12 months of age is mandatory to ensure long-lasting protection.[1] Another strategy is to find unvaccinated children who have returned to Taiwan in the previous week from endemic countries by linking the databases of the National Immunization Information System and National Immigration Agency. All unvaccinated children should then be followed-up by local health departments as the first priority.

As vaccination coverage remains high, transmission has been successfully interrupted in the community, but outbreaks in medical settings have become more important.[2,5,7–10] Factors contributing to this include more frequent visits to medical facilities by infants and toddlers,[9] the increased susceptibility of an already diseased population, and delayed implementation of control measures because of delayed diagnosis.[9] In the three outbreaks involving 22 cases, measles was not in the discharge diagnoses of seven, including two index cases. In addition, the investigations and control of these hospital outbreaks were incredibly difficult because of the complexity of the population that visit emergency departments, the crowded condition that causes interaction in close proximities, and the doctor-shopping behavior of Taiwanese resulting in patients carrying the infection to multiple medical facilities. Therefore, health care and public health staff must maintain a high level of awareness of measles. Travel and vaccination histories should be obtained for every patient. Measles should be considered for any unvaccinated patient with febrile rash illness and travel history in the past 3 weeks. Furthermore, during an outbreak, individuals with fever and rash should be fitted with a mask and be subjected to respiratory isolation.[2,11] Waiting and treatment areas should be well ventilated. Measles transmission has been documented even when the infective person has left the room 2 hours prior to the arrival of those subsequently acquiring the infection.[11] Any staff member without documented proof of measles vaccination or adequate measles antibody titers is recommended to receive measles vaccination.[12]

In conclusion, despite > 95% MMR coverage, outbreaks can still occur. Recent nosocomial outbreaks illustrated the high transmissibility of measles, the importance of adherence to the routine vaccination schedule for children and proper vaccination before traveling aboard. Health care providers should continuously be aware of measles symptoms and include measles in the differential diagnoses of febrile rash illnesses, particularly in patients with history of travel to measles-endemic areas. Maintaining high vaccine coverage by mop-up and keep-up measures, continued alertness, timely reporting and rapid response are all essential to achieve measles elimination in Taiwan.

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