UNIVERSITY of WASHINGTON
DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

MEASLES & THE MMR VACCINE: RECOMMENDATIONS AROUND PREGNANCY, INCLUDING THE PERICONCEPTION AND POSTPARTUM PERIODS

Obstetric Consensus Statement

Alisa Kachikis, MD
Elizabeth Oler, MD
Raj Swati Shree, MD
Kristina Adams Waldorf, MD
Jane Hitti, MD MPH
Linda Eckert, MD

Revised April 2019

MEASLES & THE MMR VACCINE: RECOMMENDATIONS AROUND PREGNANCY, INCLUDING THE PERICONCEPTION AND POSTPARTUM PERIODS

RATIONALE

Measles, also known as rubeola, is a highly contagious airborne viral illness that infects approximately nine out of ten exposed susceptible individuals.[1] Measles infection was common until the measles, mumps, and rubella (MMR) vaccine was licensed in 1963 and became part of the routine immunization schedule. By 2000, measles was essentially eliminated from the United States.[1] In the last decade, however, vaccination rates have waned and the incidence of measles has again risen, with one of the most recent outbreaks in the Pacific Northwest. The majority of those affected are unvaccinated, indicating that undervaccination is a risk factor for susceptibility to measles infection.[2]

What we know about measles

- The incubation period is 7-21 days; an infected individual is contagious from 4 days before until 4 days after the appearance of a rash.[1] However, immunocompromised individuals may not develop a rash.[3]
- It is transmitted via direct contact from person to person with respiratory droplets or airborne spread. The measles virus may remain airborne and infectious for up to two hours.[1,3]
- Commonly reported complications include pneumonia, otitis media, and diarrhea.[4]
- Two doses of the MMR vaccine series are 97% effective at preventing measles infection.[1]
- An estimated 92-95% of individuals in a community must be immune to prevent ongoing transmission.[5]
- Encephalitis, hearing loss, and death are very rare complications; however, these occur more commonly in infants, young children, and immunocompromised individuals.[6,7,8,9]

IN PREGNANCY

Pregnant women and young children are among the populations at highest risk for complications.[1] Measles infection in pregnant women is associated with increased risk of hospitalization and pneumonia.[10] Measles infection during pregnancy is also associated with significant risk to the fetus, including miscarriage, stillbirth, low birth weight, and an elevated risk for preterm delivery.[3,11,12] Infants born during an active maternal measles infection are at risk for congenital measles. Prior to the introduction of intravenous and intramuscular immunoglobulin therapy (IGIV and IGIM), congenital measles infection had high neonatal mortality rates.[10,11] While most women have immunity to measles due to prior MMR vaccination, given risks associated with measles in pregnancy, possible infection or exposure to measles should be carefully and expediently investigated.[1] Pregnant women with exposure but without immunity to measles may be eligible for IVIG treatment (see algorithm below).[3] Live vaccines, such as MMR, are not recommended during pregnancy due to theoretical risks to the mother and fetus; however adverse effects on fetuses when live vaccines are inadvertently administered during pregnancy have not been found.[3] In women at low risk for contracting measles, a documented history of one prior MMR vaccine is sufficient to confirm immunity. See algorithm below for guidance in managing high risk pregnant patients – those living in, or traveling to, areas with an active outbreak.

® Copyright UW Medicine, 2019

IN THE PERICONCEPTION PERIOD

Women of reproductive age and those contemplating conception should assess their measles immune status with their primary health provider prior to pregnancy (see algorithm below).[3] After receiving the MMR vaccine, women should wait 4 weeks prior to attempting conception given theoretical risks to the fetus with live vaccines; however inadvertent MMR vaccination in the periconception period or in early pregnancy should not be considered an indication for termination of pregnancy.[3]

IN THE POSTPARTUM PERIOD

Women who are found to be non-immune to measles or rubella should receive the MMR vaccine immediately after delivery.[3] Breastfeeding has not been shown to affect the immune response to MMR. MMR vaccine is safe in breastfeeding mothers and has not been shown to have adverse effects in neonates.[13,14] While breast milk transfer of measles protective maternal antibodies to the infant has not been well studied, maternal antibodies have been shown to be protective for the infant in other viral illnesses such as influenza.[15]

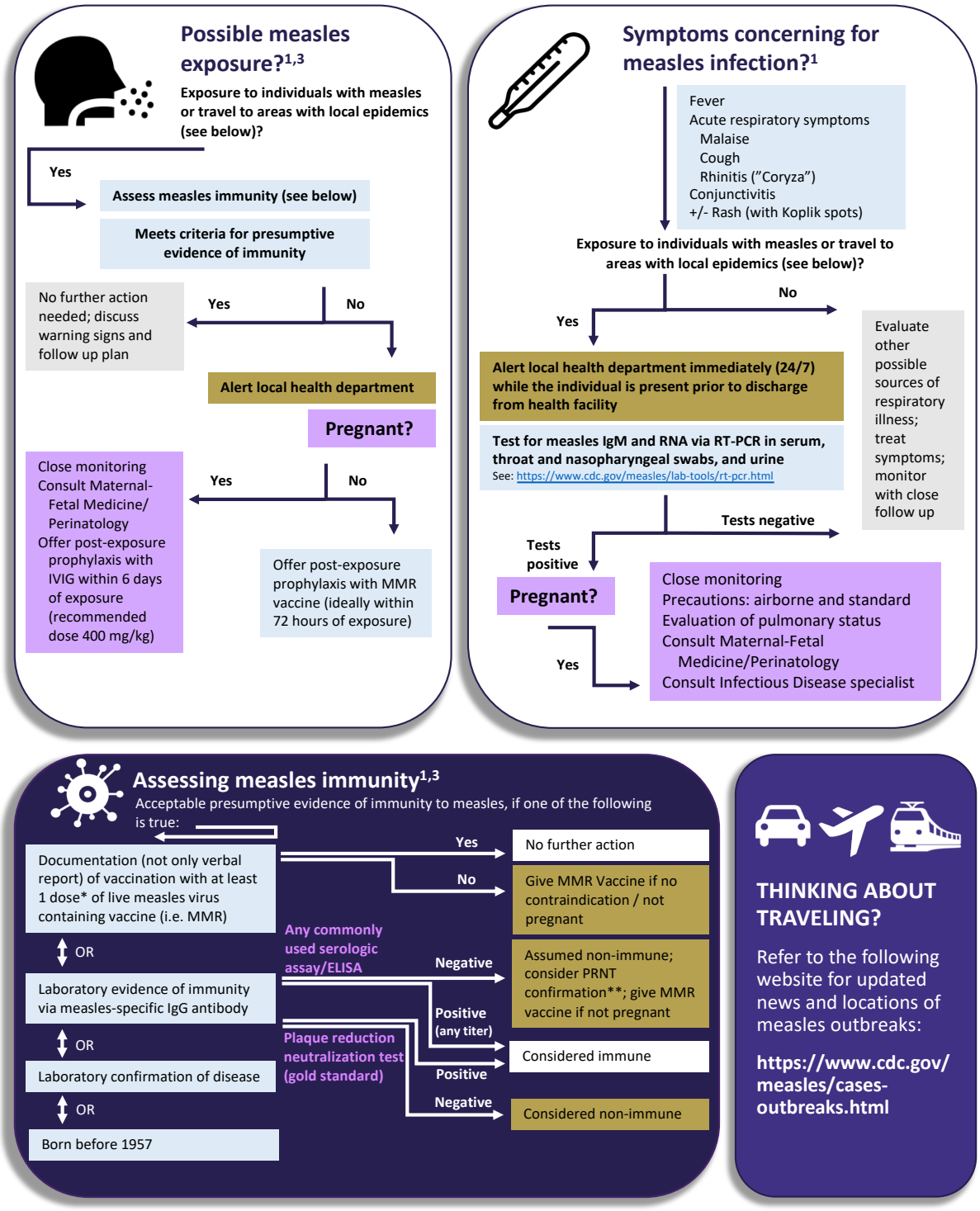
ASSESSING IMMUNITY

Given risks associated with measles in pregnancy, possible infection or exposure to measles should be carefully and expediently investigated, and reproductive health providers should follow guidance by local health departments in areas of active outbreak.[1] In these regions, it is imperative to assess immunity at the first prenatal visit (see algorithm). In the general population, including pregnant women, documentation of one dose of MMR is sufficient to assume immunity to measles. High-risk individuals, such as health-care personnel, students at post-high school institutions, and international travelers, should have two doses of MMR documented as evidence for presumptive immunity (see algorithm).[3] If the patient has two doses of the MMR vaccine documented and presence of a positive rubella titer, immunity to measles is likely; in one study of 262 pregnant women in Canada, measles susceptibility was present in only 0.8% of rubella seropositive women, when tested via gold-standard plaque reduction neutralization test (PRNT).[16] Several studies have shown lower correlation between rubella and measles immunity, however these studies utilized standard enzyme-linked immunosorbent assay (ELISA) tests which have significantly lower sensitivity than PRNT.[17,18]

It is important to note that ELISA is the only test available in commercial laboratories. Although PRNT is the gold standard assay, it is more labor intensive and expensive, and is performed only in specialized laboratories such as those at the Centers for Disease Control and Prevention (CDC). The ELISA is less sensitive than the PRNT and negative results in particular should be interpreted with caution.[19,20,21,22] One study in the UK correlating ELISA with PRNT revealed automated ELISA sensitivity and manual ELISA sensitivity, relative to PRNT, of 42% and 72%, respectively. Specificity for the automated and manual ELISA tests, however, was 100% and 97% respectively.[19] These results suggest that a negative ELISA is ideally sent for PRNT testing for confirmation of susceptibility. Any positive immunoglobulin (IgG) result or titer by ELISA confirms immunity and no further testing is necessary.

® Copyright UW Medicine, 2019

ALGORITHM FOR EVALUATION OF MEASLES RISK AROUND PREGNANCY



*In the general population, including pregnant women, documentation of one dose of MMR is sufficient to assume immunity to measles. High-risk individuals, such as health-care personnel, students at post-high school institutions, and international travelers, should have two doses of MMR documented as evidence for presumptive immunity.[3]

**PRNT assays are labor- and time-intensive, and may not be readily available. In addition, PRNT assays may not result for days or weeks. Therefore, immunity testing availability and algorithms should be discussed with the local health department.

Abbreviations: ELISA, enzyme-linked immunosorbent assay; IVIG, intravenous immunoglobulin; MMR, measles mumps and rubella vaccine; PRNT, plaque reduction neutralization test; RT-PCR, real-time polymerase chain reaction.

® Copyright UW Medicine, 2019

REFERENCES

1. Centers for Disease Control and Prevention. Measles (Rubeola): For healthcare professionals. Updated 2019. Accessed 20 February 2019. [Available at: https://www.cdc.gov/measles/hcp/index.html].
2. Clark County Washington Public Health. Measles investigation. Updated 2019. Accessed 20 Feburary 2019. [Available at: https://www.clark.wa.gov/public-health/measles-investigation].
3. McLean HQ, Fiebelkorn AP, Temte JL, Wallace GS. Prevention of measles, rubella, congenital rubella syndrome, and mumps, 2013: summary recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recommendations and reports : Morbidity and mortality weekly report Recommendations and reports. 2013;62(Rr-04):1-34.
4. Perry RT, Halsey NA. The clinical significance of measles: a review. J Infect Dis 2004;189(Suppl 1):S4–16.
5. World Health Organization. Measles vaccines: WHO position paper - April 2017. Wkly Epidemiol Rec. 2017;92(17):205-27.
6. Babbott FL Jr, Gordon JE. Modern measles. Am J Med Sci 1954; 228:334–61.
7. Miller DL. Frequency of complications of measles, 1963. Report on a national inquiry by the Public Health Laboratory Service in collaboration with the Society of Medical Officers of Health. BMJ 1964;2:75–8.
8. Gindler J, Tinker S, Markowitz L, et al. Acute measles mortality in the United States, 1987–2002. J Infect Dis 2004;189(Suppl 1):S69–77.
9. Wolfson LJ, Grais RF, Luquero FJ, Birmingham ME, Strebel PM. Estimates of measles case fatality ratios: a comprehensive review of community-based studies. Int J Epidemiol 2009;38:192–205.
10. Atmar RL, Englund JA, Hammill H. Complications of measles during pregnancy. *Clin Infect Dis*. 1992;14(1):217-226.
11. Manikkavasagan G, Ramsay M. The rationale for the use of measles post-exposure prophylaxis in pregnant women: a review. J Obstet Gynaecol 2009;29:572–5.
12. Rasmussen SA, Jamieson DJ. What obstetric health care providers need to know about measles and pregnancy. *Obstet Gynecol*. 2015;126(1):163-170.
13. Centers for Disease Control and Prevention. Measles, Mumps, and Rubella (MMR) Vaccination: What Everyone Should Know. 2016; updated 2018. Accessed 23 February 2019. [Available at: https://www.cdc.gov/vaccines/vpd/mmr/public/index.html].
14. Measles-Mumps-Rubella-Varicella Vaccine. Drugs and Lactation Database (LactMed). Bethesda (MD): National Library of Medicine (US); 2006.
15. Influenza Vaccines. Drugs and Lactation Database (LactMed). Bethesda (MD): National Library of Medicine (US); 2006.
16. Libman MD, Behr MA, Martel N, Ward BJ. Rubella susceptibility predicts measles susceptibility: Implications for postpartum immunization. *Clin Infect Dis*. 2000;31(6):1501-1503.
17. Haas DM, Flowers CA, Congdon CL. Rubella, rubeola, and mumps in pregnant women: Susceptibilities and strategies for testing and vaccinating. *Obstet Gynecol*. 2005;106(2):295-300.
18. Kennedy CM, Burns BA, Ault KA. Does rubella immunity predict measles immunity? A serosurvey of pregnant women. *Infect Dis Obstet Gynecol*. 2006;2006:13890.
19. Cohen BJ, Doblas D, Andrews N. Comparison of plaque reduction neutralisation test (PRNT) and measles virus-specific IgG ELISA for assessing immunogenicity of measles vaccination. *Vaccine*. 2008;26(50):6392-6397.
20. Goncalves G, Cutts F, Forsey T, Andrade HR. Comparison of a commercial enzyme immunoassay with plaque reduction neutralization for maternal and infant measles antibody measurement. *Rev Inst Med Trop Sao Paulo*. 1999;41(1):21-26.
21. Ratnam S, Gadag V, West R, et al. Comparison of commercial enzyme immunoassay kits with plaque reduction neutralization test for detection of measles virus antibody. *J Clin Microbiol*. 1995;33(4):811-815.
22. Tischer A, Gassner M, Richard JL, Suter-Riniker F, Mankertz A, Heininger U. Vaccinated students with negative enzyme immunoassay results show positive measles virus-specific antibody levels by immunofluorescence and plaque neutralisation tests. *J Clin Virol*. 2007;38(3):204-209.

CITATION

Kachikis A & Oler E, Shree R, Adams Waldorf K, Hitti J, Eckert LO. Measles and the MMR vaccine: recommendations around pregnancy, including the periconception and postpartum periods: obstetric consensus statement. University of Washington, revised April 2019. Available at http://providerresource.uwmedicine.org/reproductive-perinatal-and-neonatal-care.

® Copyright UW Medicine, 2019