Detection of Mumps Virus Vaccine Strain in Breast Milk After Postpartum Vaccination

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Objective: To clarify whether a lactating mother can give breast milk after vaccination for the mumps virus.

Material and Methods: A mother with a negative antibody titer for mumps virus had breastfed since before receiving a mumps viral vaccination and continued maternal feeding after inoculation. RT-LAMP and nested RT-PCR were used to examine breast milk samples 15, 22, 29, 42, and 49 days after the vaccination.

Results: RT-LAMP was only positive for mumps virus in the breast milk 29 days after vaccination. Samples measured using nested RT-PCR were positive 29 and 42 days after the vaccination.

Conclusions: The baby did not develop mumps, despite being fed with breast milk including the mumps viral vaccine strain. It will be necessary to determine whether babies can acquire immunity through exposure to a viral vaccine strain via breast milk.

Key words: mumps virus, postpartum, breast milk, vaccination

Introduction

Mother–to-child viral transmission during pregnancy is a problem, and it is important to prevent the development of infectious diseases before pregnancy. Live vaccination of pregnant women is generally contraindicated due to the high risk of prenatal infection. Due to the risk of viral infection via breast milk, vaccination is generally not performed for lactating women. In this study, mumps viral vaccine strain was measured in breast milk and saliva from the baby over time after vaccination of a lactating mother who was negative for mumps virus IgG titer, in order to prevent mumps viral infection during an epidemic.

Case

The patient was a 36-year-old mother with no history of mumps or vaccination. When the mumps antibody level was measured 30 days after delivery, due to a mumps viral epidemic, the mumps IgG titer was 1.3 (EIA method), which was below the protection level for mumps. While the mother was lactating, she hoped to receive a vaccination. After providing a full explanation and obtaining informed consent, she was vaccinated for mumps virus 50 days after delivery (Mumps virus vaccine strain: Torii strain). Even after the mumps viral vaccination, maternal feeding continued, and collection of samples of breast milk and saliva from the baby was commenced from 15 to 49 days after the vaccination, respectively. The baby was a 3-month-old healthy boy.

The mumps virus in the breast milk was examined using reverse transcription–loop-mediated isothermal amplification (RT–LAMP) and nested reverse transcription polymerase chain reaction (RT–PCR). Mumps viral LAMP primers were
prepared based on the report of Okafuji et al.\textsuperscript{1)}, and examined under the reaction conditions of 63°C for 60 minutes. Nested RT-PCR was performed based on the report of Kidokoro et al.\textsuperscript{2)}. RT–LAMP and nested RT-PCR was used to examine the breast milk samples 15, 22, 29, 42, and 49 days after the vaccination (Table-1). RT–LAMP for mumps virus in the breast milk was only positive 29 days after the vaccination, while samples measured using nested RT-PCR were positive 29 and 42 days after the vaccination. In measuring for mumps virus using RT–LAMP in saliva from the baby 42 and 49 days after vaccination of the mother, and using nested RT-PCR on a sample 49 days after the vaccination, all data were negative. Sequence analysis was performed with the RT-PCR products as the template\textsuperscript{2)}, and identified the mumps vaccine virus Torii strain.

The baby received maternal feeding continuously, both before and after the vaccination. No symptoms of mumps were observed in the baby during the follow-up for 50 days or more after the vaccination.

**Discussion**

In Japan, although vaccination of lactating women is not contraindicated, vaccination is not actively recommended. The guidelines from the US Centers for Disease Control and Prevention (CDC)\textsuperscript{3)} suggest that vaccinations other than smallpox vaccination can be administered, depending on the situation.

There are only limited data to show the transfer of a vaccine strain against vaccine preventable diseases (VPD) to breast milk, and no information is available regarding the transfer of individual VPD virus to breast milk. Furthermore, while a baby may be exposed to a vaccine via breast milk, it remains unclear whether the baby can acquire immunity without development of the disease. To our knowledge, there have been no reports of nursing babies becoming infected by a vaccine strain. There is no uniform consensus on whether a lactating woman should suspend breast-feeding after vaccination in Japan.

Mothers who have not been vaccinated before delivery can receive a vaccination after delivery regardless of the feeding method. The vaccines that uninoculated, lactating mothers could receive include: inactivated polio, rubella, and Tdap (Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine)\textsuperscript{4)}. Inactivated polio vaccinations may be administered to persons who plan to visit an endemic region. Rubella vaccination should be performed in the early phase after delivery when rubella antibody in serum is negative, and Tdap vaccination should be performed immediately after delivery. When examining breast milk from a pregnant woman who developed mumps 2 days prior to delivery, mumps virus was detected using a method for isolating the virus\textsuperscript{5)}. Nevertheless, the baby delivered from the woman did not develop mumps and was antibody-negative, suggesting no development of infection. Infants are considered to have low sensitivity to the mumps virus, and there are relatively few reports on the development of mumps in infants. On the other hand, in a report on infection of a newborn baby with mumps virus, it was suggested that the baby exhibited respiratory impairment, but no parotid swelling, and no clinical presentation of typical parotid gland inflammation\textsuperscript{6)}. Thus, it was difficult to make the diagnosis.

In our study, because the mumps virus vaccine

<table>
<thead>
<tr>
<th>days after immunization</th>
<th>15</th>
<th>22</th>
<th>29</th>
<th>42</th>
<th>49</th>
</tr>
</thead>
<tbody>
<tr>
<td>mother (breast milk)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT–LAMP</td>
<td>(-)</td>
<td>(-)</td>
<td>(+)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>nested RT-PCR</td>
<td>(-)</td>
<td>(-)</td>
<td>(+)</td>
<td>(+)</td>
<td>(-)</td>
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<tr>
<td>infant (saliva)</td>
<td></td>
<td></td>
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<tr>
<td>RT–LAMP</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>nested RT-PCR</td>
<td>N.D.</td>
<td>N.D.</td>
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N.D.; not done, (+); positive, (-); negative  

RT–LAMP: reverse transcription Loop-Mediated Isothermal Amplification  
RT-PCR: reverse transcription polymerase chain reaction
strain can be detected in saliva after infection, we decided to look for mumps virus in the saliva from the baby to provide proof of the mumps viral infection. While the mother’s milk samples were positive for mumps virus 29 and 42 days after vaccination, the mumps virus was not detected in saliva from the baby 42 and 49 days after the mother had been vaccinated. Therefore, we concluded that the baby did not develop the mumps. It was inferred that the differences observed 42 and 49 days after inoculation were due to variations in the examination sites, as the mumps RT-PCR and RT-LAMP use different primers and the sensitivities vary between the tests.

There has been one report that the constituents of breast milk may inhibit the activity of mumps virus\(^7\). In the future, it will be necessary to determine whether a baby can acquire immunity through exposure to a viral vaccine strain via breast milk. In this study, it was shown that a nursing mother could be inoculated with the mumps viral vaccine without a problem.

### Reference