

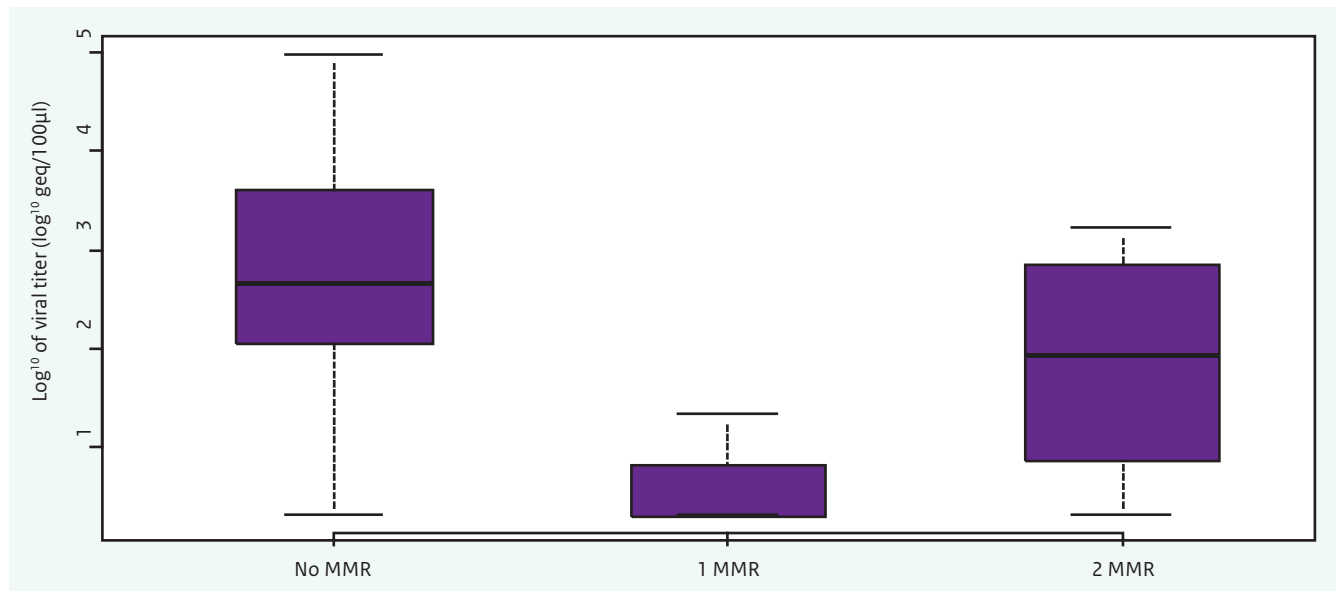
# Mumps virus transmission to close contacts by mumps vaccinated individuals

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## Background

Mumps epidemics occur frequently in countries where mumps vaccination have been introduced, attacking both unvaccinated and mumps vaccinated individuals. As mumps disease is transmitted through airborne respiratory droplets, the viral mumps titers in oral fluid can be considered an important parameter in defining the infectiousness of a mumps patient. However, data about viral shedding of mumps patients is sparse and the contribution of vaccinated individuals on viral transmission during an outbreak is still unclear. Between August 2007 and April 2009, a large genotype D mumps epidemic was ongoing in the Netherlands. This gave the opportunity to assess viral shedding of vaccinated patients by determining the viral titer in oral fluid specimens. Furthermore, we studied family members of vaccinated mumps patients for clinical symptoms and for specific IgG antibodies, indicative for recent (a)symptomatic mumps infection.



**Figure 2.** Box plots of estimated mumps viral titers on basis of the quantitative PCR within the first three days after onset of clinical symptoms, among unvaccinated and vaccinated patients (1 and 2 MMR).

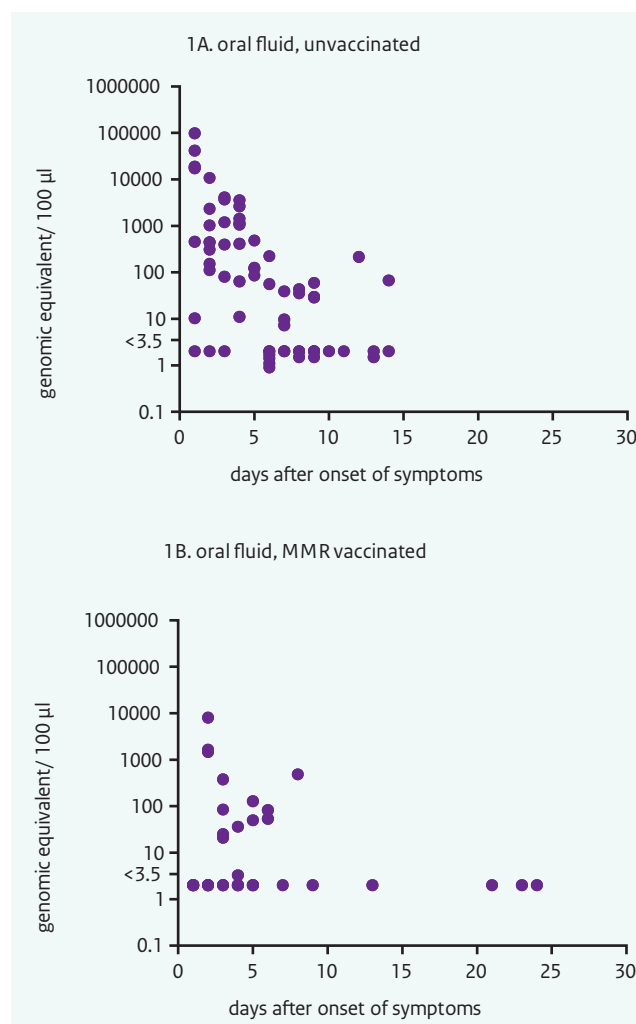
**Tabel 1**

Family members	Number of individuals investigated	Number of mumps sero-positive individuals	Median duration (yr) since last vaccination
Adults	92	*	-
Siblings (not-vaccinated)	2	0 **	-
Siblings (vaccinated)	66	9 ***	4.1

\* No validated serological test available for this analysis.

\*\* Above cutoff (OD >0.15) indicative for recent asymptomatic mumps infection. Oral fluid tested with mumps IgG specific ELISA (Microimmune assay).

\*\*\* Above cutoff (OD >0.40) indicative for recent asymptomatic mumps infection. Oral fluid tested with mumps IgG specific ELISA



**Figure 1.** Mumps viral titers in relation to date of onset of clinical symptoms, among unvaccinated (1A) and vaccinated (1B) patients.

## Methods

1. Mumps viral titers in oral fluid specimens obtained from both vaccinated (n=60) and unvaccinated (n=111) mumps patients were analysed by quantitative real time PCR. The patients were selected on basis of clinical presentation and included after laboratory confirmation (positive PCR on urine, oral fluid or throat swab specimens).
2. Family members of vaccinated mumps cases were investigated for the occurrence of clinical mumps infection by questionnaire and by analyzing the levels of mumps specific IgG antibodies in oral fluid. 36 family members of vaccinated mumps patients participated in the study.

## Results

1. The viral titer in oral fluid is highest shortly after onset of disease and decreases sharp over time. Figure 1A and 1B illustrate this on basis of a single specimen collection from unvaccinated and vaccinated patients in relation to the time since onset of disease. Figure 2 presents box plots of viral titers for both unvaccinated and vaccinated patients for samples collected within the first three days post onset of disease. Vaccinated patients clearly show lower viral titers. In a multivariate analysis, vaccination had a significant negative effect on viral titers (P=0.05, data not shown).
2. No symptomatic cases were reported among household contacts (n=164) of vaccinated mumps patients. However there was serological evidence of asymptomatic infection among vaccinated household contacts (9 out of 70 vaccinated siblings). For two of these siblings, the vaccinated index patient is the most probable source of infection.

## Conclusions

1. Vaccinated mumps patients shed mumps virus in variable amounts, although the peak concentration in oral fluid is lower compared to unvaccinated patients.
2. No evidence was found of clinical mumps for vaccinated persons who had been in contact with a clinical vaccinated case in a household setting. However, mumps specific IgG antibody titers indicated that viral transmission by vaccinated mumps patient can lead to subclinical infections among vaccinated family members.

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