

Practice of Offering a Child Pre-masticated (Pre-chewed) Food: An Unrecognized Possible Risk Factor for HIV transmission

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Abstract

Background: Although some caregivers are known to pre-masticate food for infants usually during the weaning period, HIV transmission has not been linked to this practice. We describe three cases of HIV transmission in two cities in the U.S. over a decade, possibly related to this practice.

Methods: A thorough investigation to rule out alternative modes of transmission was conducted by primary care staff and Health Department investigators. Blood samples from the cases and suspected sources were sent to the CDC for HIV DNA extraction, amplification, sequencing, and genetic and phylogenetic analysis using the C2V3C3 or gp41 region of *env* and the p17 coding region of *gag*. Phylogenetic comparisons of virus from cases and suspected available sources were performed.

Results: Case 1 (Memphis) presented at age 9 months with fever, failure to thrive, jaundice, and had a positive HIV RNA PCR preceded by three negative RNA PCRs prior to age 4 months. Case 1s HIV-infected mother reported pre-masticating the child's food starting at age 4 months. After two previous negative HIV serologies at ages 21 and 22 months, Case 2 (Miami) tested positive for HIV (ELISA/Western Blot) at age 39 months during a workup for recurrent submandibular lymphadenitis. Case 2s HIV-infected mother reported offering the child pre-masticated food intermittently. Case 3 (Miami) tested positive for HIV (ELISA/Western Blot) at age 15 months during a workup for recurrent diarrhea/otitis. Case 3s HIV-uninfected mother reported that the child's HIV-infected aunt fed the child pre-masticated food between ages 9 to 14 months. Case 1s mother and Case 3s aunt were reported to have bleeding gums while pre-masticating. A thorough investigation of these cases did not reveal other modes of HIV transmission (i.e., breast feeding, percutaneous injuries or sexual abuse). Phylogenetic analysis showed strong relatedness of the virus from the infant and mother in Cases 1 and 2 and ruled out a household contact (aunt's partner) as a source of infection in Case 3. Case 3s aunt died before blood could be collected for this investigation.

Conclusions: While all 3 cases raise the index of suspicion, 2 of the cases provide compelling evidence linking pre-mastication to HIV transmission. This route of transmission of HIV has not to our knowledge been previously reported. The risk of infant HIV transmission associated with pre-mastication of food deserves further investigation and has important global implications.

Introduction

- There is increasing focus on identifying missed opportunities for diagnosis and intervention to prevent mother-to-child transmission of HIV.
- A traditional practice of offering a child pre-masticated (pre-chewed) food has been reported from various parts of the world including the US.
- Investigation of an HIV infection diagnosed in a 9-month old child in Tennessee following three prior negative HIV tests (see Case 1, below) revealed that the mother had regularly fed the child pre-masticated (pre-chewed) food. In the absence of alternative explanations for HIV infection, the child's HIV care provider contacted CDC and inquired about similar reports; pediatric HIV care providers in Miami reported two additional cases possibly attributable to this childcare practice that had occurred a decade before.
- Described in this report are the three cases of HIV infection in children noted in two U.S. cities where transmission likely occurred through the child-rearing practice of offering a child pre-masticated (pre-chewed) food; a route of transmission as yet unreported.

Methods

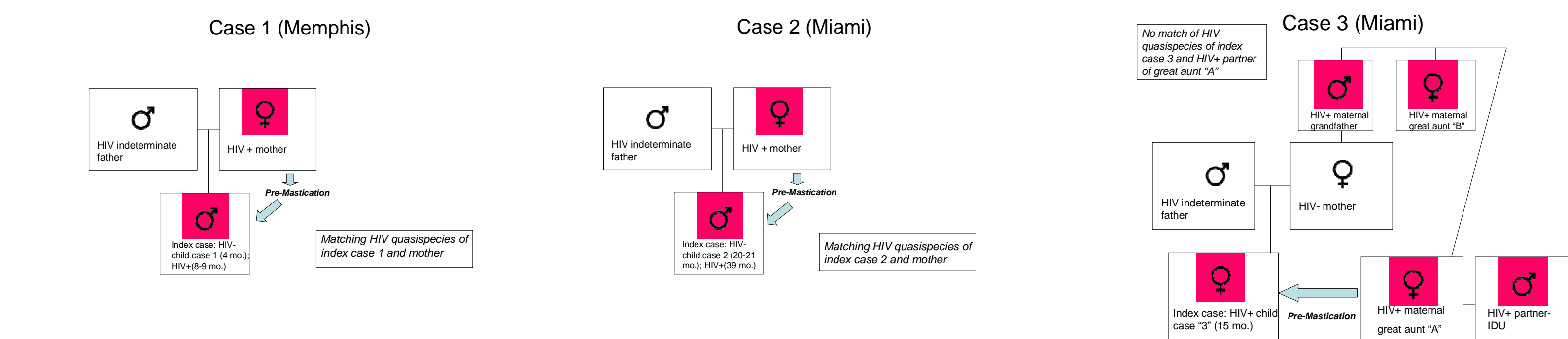
Local health departments investigated the three cases through interviews of all involved persons and review of available medical records.

Blood specimens were sent to the CDC for HIV nucleic acid extraction, polymerase chain reaction (PCR) amplification and genetic sequencing of the C2V3C3 or gp41 coding regions of *env* and the p17 coding region of *gag*.⁶

All persons, or their adult caregivers, consented to specimen collection and participation in the investigation

Results

Inability to explain the route of HIV transmission combined with eliciting a history of offering the child pre-masticated (pre-chewed) food prompted clinicians in Miami and Memphis to suspect and report three cases of suspected HIV transmission related to this child care practice.



Case 1 (Memphis)

In 2004, a 9-month-old African-American female child presented to an emergency room in Tennessee with fever, jaundice, nose bleed, thrush, and failure to thrive. Her mother was known to have chronic HIV-1 infection. The child was diagnosed at this time with HIV-1 infection based on a viral load test (RNA-PCR; Amplicor HIV-1 Monitor test, version 1.5) that indicated >100,000 copies/mL of HIV-1 (confirmed on repeat viral load testing). Prior to this diagnosis, three quantitative HIV-1 viral load tests (RNA PCRs) performed at days 41, 60, and 118 of life had all been negative (i.e., no detectable HIV-1 RNA).

The mother reported taking highly active antiretroviral therapy (HAART) during pregnancy and postpartum. The child was delivered at 35 weeks of gestation via cesarean section (for maternal reasons; membranes not ruptured). The mother reported giving oral zidovudine to the baby during the first six weeks of life and denied ever breast feeding the child.

The mother reported intermittently offering the child pre-masticated meats starting at approximately 120 days of life. She continued the practice until the child's current illness. The mother reported that her gums bled spontaneously approximately once a month. She also reported getting sores in her mouth once or twice a month. Repeated history and physical examination did not reveal other modes of HIV transmission, specifically, no history or evidence of percutaneous injuries, transfusion, other parenteral exposures or sexual abuse.

Case 2 (Miami)

An African-American child born to an HIV-infected mother was followed prospectively in the University of Miami Pediatric HIV Screening Clinic until HIV-1 infection was ruled out based on negative HIV-1 ELISA tests (Organon Teknica) at ages 20 and 21 months. In 1995, at age 39 months, the child was seen by a pediatrician for anemia and recurrent submandibular lymphadenitis with abscess due to *Mycobacterium fortuitum*. A maternal history of AIDS and intranasal cocaine abuse (no intravenous drug abuse reported) combined with the clinical presentation of the child prompted the pediatrician to order an HIV-1 ELISA and confirmatory Western blot test, which were both positive. Other testing included a positive p24 antigen test and a low CD4 cell count (24 cells/ μ l [1%]).

The mother reported offering the child pre-masticated food in the past but could not specify the time frame of this practice. Details regarding the mother's oral health when she was pre-masticating the child's food were unknown. Repeated history and physical examination did not reveal other modes of potential HIV transmission, specifically no history or evidence of breast feeding, sexual abuse, transfusion, or accidental needle stick exposure. There were no other known contacts with HIV-infected persons in the household.

Case 3 (Miami)

In 1993, a 15-month-old African-American child was seen by a pediatrician in Miami for recurrent diarrhea and otitis media. HIV-1 ELISA tests (Organon Teknica) and Western blots at ages 15, 16 and 19 months were positive. The mother tested HIV-1 negative by ELISA three times around the time of the child's positive tests. The child was reported to have been healthy prior to the onset of diarrhea.

The mother reported that both she and the infant had previously lived with an HIV-infected maternal great aunt for several months when the child was age 9-14 months. During this time the aunt helped care for the child and had given him food that she had pre-masticated. On more than one occasion, the mother noted that the aunt had actively bleeding gums while she pre-masticated the child's food. When the child was approximately age 14 months, the aunt died from pneumonia.

The aunt had been in a 12-year sexual relationship with an HIV-infected man who had a history of intravenous drug use. The mother stated that he did not use intravenous drugs in the house during the time she and the child had resided there. She did not recall seeing any needles in the house and denied that the child was ever stuck by one. She did not think that the child had been sexually abused by this man. History and physical examination of the child demonstrated no evidence of prior blood transfusion, receipt of organ transplant or intravenous medications, any other parenteral exposures or sexual abuse.

Attempts to obtain leftover clinical specimens from the deceased maternal great aunt for HIV phylogenetic testing were unsuccessful and her remains had been cremated.

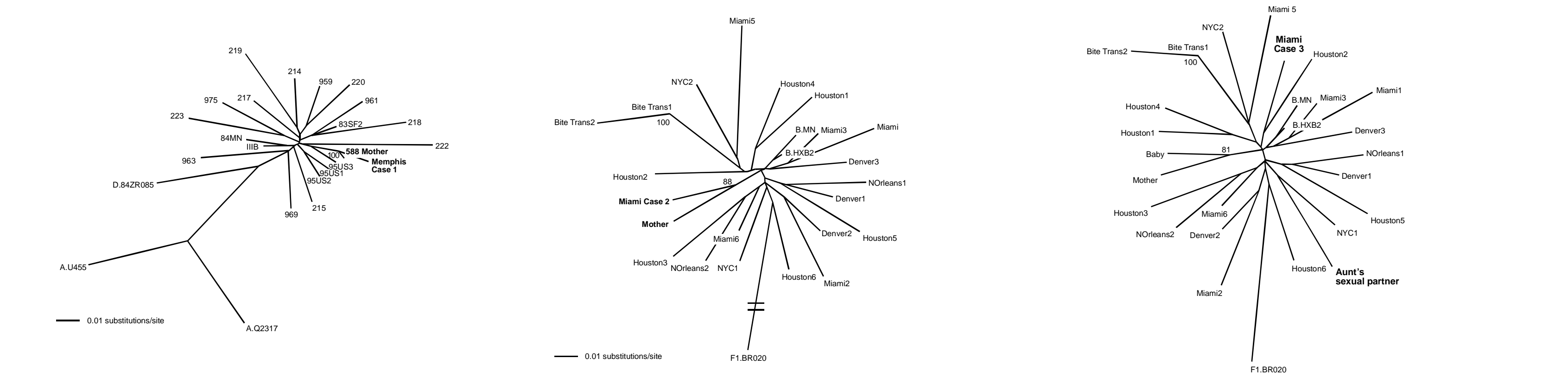


Figure 1: Phylogenetic relationship of the HIV sequences derived from Case 1 maternal-infant dyad from Memphis, unrelated subtype strains from the United States (19 subtype B, 2 subtype A, and 1 subtype D)

Neighbor joining tree of the gp17 region of *gag*; U.S. subtype B sequences and one subtype D sequence were used as reference strains in the tree, and two subtype A sequences were used as an out group. Only bootstrap values of >70% are indicated for the subtype B branching order. This phylogenetic analysis shows strong clustering, with a 100% bootstrap support for the epidemiologic relatedness of the virus from Case 1 (Memphis) and the child's mother.

Figure 2: Phylogenetic relationship of the HIV sequences derived from Case 2 maternal-infant dyad from Miami, 5 unrelated subtype B strains from Miami (Miami 1-4, 6), 15 unrelated subtype B strains from US cities other than Miami

(Denver 1-3, Houston 1-6, New Orleans 1-2, NYC 1-2, B.MN, and B.HXB2), 1 unrelated subtype F strain (F1.BR020) and 1 epidemiologically-related bite transmission pair (Bite Trans 1-2). Neighbor joining tree of the gp17 region of *gag*; only bootstrap values of >70% are indicated. U.S. subtype B sequences were used as reference strains along with a subtype F as an out group. Sequences from an epidemiologically related transmission pair were also included (Bite Trans 1&2; Baby & Mother). Phylogenetic analysis shows strong clustering, with an 88% bootstrap support for the epidemiological relatedness between the virus from Case 2 (Miami) and the child's mother.

Figure 3A: Phylogenetic relationship of the HIV sequences derived from Case 3 Aunt's partner-child dyad from Miami, 5 unrelated subtype B strains from Miami (Miami 1-3, 5-6), 15 unrelated subtype B strains from U.S. cities other than Miami (Denver 1-3; Houston 1-6; NOreans 1-2, NYC 1-2; B.MN; and B.HXB2), 1 unrelated subtype F strain (F1.BR020) and 2 epidemiologically-related transmission pairs (Bite Trans 1-2; Baby and Mom).

Neighbor joining tree of the gp17 region of *gag*; only bootstrap values of >70% are indicated. U.S. subtype B sequence strains were used as references along with subtype F as an out group. Sequences from two epidemiologically related transmission pairs were also included (BiteTrans1&2; Baby & Mother). Phylogenetic analysis shows no clustering or epidemiological relatedness between the virus from Miami Case 3 (Child) and the care provider's (aunt's) boyfriend (Auntpartner).

Conclusions

- The cases described in this series suggest that HIV may be transmitted through consumption of food contaminated with virus by pre-mastication. To our knowledge, this route of HIV transmission has not been previously reported. We propose that bleeding in the oral cavity of the adult who pre-masticated the food (definitive history available in Cases 1 and 3) contaminated food with an infectious dose of HIV. Among the infants, a break in the integrity of their oral mucosa may have facilitated viral entry. Such breaks can occur during teething or oral candidiasis, common childhood conditions that were seen in Case 1.
- We recommend health care providers routinely query children's caregivers and expecting parents about the practice of pre-masticating food. Until the risk of pre-mastication and modifying factors (e.g. periodontal disease) are better understood, we recommend that children's caregivers and expecting parents who are HIV infected or at high risk of HIV infection should be advised against this practice.
- We further recommend that providers identify the extent to which pre-mastication occurs in their communities and that cases of HIV infection that may have occurred through pre-mastication be reported to public health authorities for investigation.
- The risk of infant HIV transmission associated with pre-mastication of food deserves further investigation and has important global implications.

Acknowledgement and Disclaimer

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The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.