Clostridium difficile Colonization in the First Year of Life

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Background

- Incidence of *Clostridium difficile* infection (CDI) has doubled in the last 20 years
- Community-associated CDI (CA-CDI), a condition not predisposed by traditional risk factors, has been found to be associated with infant contact, suggesting babies are a reservoir for adult infection.

Goals

- To identify risk factors associated with *C. difficile* acquisition in healthy infants.

Methods

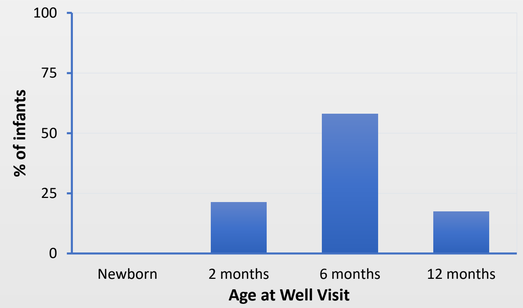
- We recruited 50 healthy, full term infants at birth and followed them at well-visits with their pediatrician (PCP) up to 1 year.
- Stool samples were collected and questionnaires were administered while in the newborn nursery and at the 2-month, 6-month, and 12-month well-child visits.
- Stool samples were inoculated on pre-reduced CCFA agar under strict anaerobic conditions and CFUs per milligram stool were quantified by serial dilution.
- *C. difficile* isolates underwent polymerase chain reaction (PCR) to detect the presence of toxin genes.
- Enzyme-linked immunosorbent assay (ELISA) was used to detect toxin in the stool sample.

Table 1: Infant characteristics at birth

	Infants, N=50
Gestational Age (weeks)	39.3 [38.3, 40.2]
Male	23 (46.0%)
Birth Method	
Vaginal	36 (72.0%)
Cesarean	14 (28.0%)
Feeding Plan	
Breast milk	43 (86.0%)
Formula	1 (2.0%)
Both	6 (12.0%
Antibiotics	
Prenatal	5 (10.0%)
Intrapartum	26 (52.0%)
Neonatal	0 (0.0%)

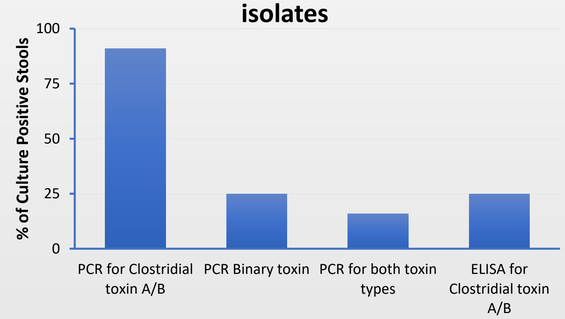
Categorical data is presented as N (%). Continuous data is presented as Median [IQR]

Figure 1: Longitudinal incidence of *C. difficile* positive stools



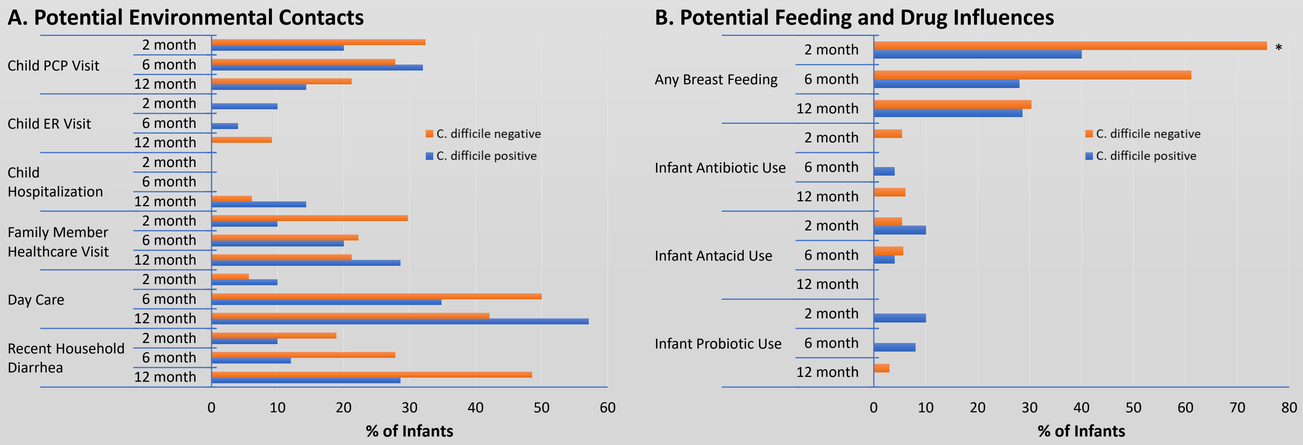
Data includes both toxigenic and nontoxigenic strains of *C. difficile*. 64% of infants were culture positive for *C. difficile* at any time point. 16% of infants were culture positive at multiple time points. **8 samples had greater than 4.5 log10 CFU of toxigenic *C. difficile*/gram of stool (1 at 2 months, 5 at 6 months, 2 at 12 months).**

Figure 2: Molecular characteristics of *C. difficile* isolates



ELISA was performed on native stool samples. **91% of *C. difficile* were PCR-positive for toxins A and B.**

Figure 3: Potential Risk Factors for *C. difficile* Acquisition



Data includes both toxigenic (91% of samples) and non-toxigenic (9% of samples) *C. difficile* isolates. Risk factors at each time point are reported as exposures since the preceding well-visit. * $p < 0.05$. All other comparisons were not significant.

Conclusions

- In the era of increased incidence of CA-CDI in adults, we found that *C. difficile* acquisition in infants was common, peaked at 6 months of age, and could be excreted at high titer.
- 91% of *C. difficile* isolates were PCR positive for toxin A/B.
- Toxin was detected in 25% of cultures positive stools.
- Among culture positive infants, we were unable to find any association with risk factors commonly associated with *C. difficile* acquisition in adults.
- Breast feeding may be protective of *C. difficile* acquisition, however, we did not see a sustained association.

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