Characterization of the Microbiome in the Infant Diapered Area: Insights from Healthy and Damaged Skin

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INTRODUCTION

The human microbiome is an evolving area with potential to impact health and wellness. Research has focused on the adult skin microbiome and less is known about the infant skin microbiome and the role it plays in growth and development. In the adult it is known that the skin microbiome can change during episodes of diaper dermatitis (DD) (Capone, 2011), and this may be attributed to exposure of this skin to urine and fecal material and changing conditions throughout the day. A recent study of diaper dermatitis (DD) prevalence in three geographies showed differences in rash rates by anatomical region of the diapered area with the perianal region having the highest rash rates (Carr, 2017). This opens two questions: do the unique environmental aspects of different regions of the diapered area result in different microbiota and does this influence DD?

OBJECTIVE

This study characterizes bacterial and fungal communities of 4 areas in the diaper region during episodes of DD.

METHODS

The study was a 4-week longitudinal surveillance study and included 18 babies, ages 2-5 months, with at least 1 moderate rash event in the past 2 months prior to study start and at least 1 episode of rash during the 4-week study period. 3 to 7 days before enrollment, babies were assigned to a standard diaper and wipe product to be used according to their existing habits. Parents were asked to avoid use of any topical skin product during the study period. Other inclusion criteria; full time use of special skin care products, a systemic condition that requires ongoing medication, chronic dermatologic condition, or have taken any systemic medication within three months before enrollment.

RESULTS

BACTERIAL COMPOSITION IS DIFFERENT BY ANATOMICAL REGION

There were distinct microbiome communities in the 4 diaper regions. The relative abundance of Staphylococcus was highest in the intertriginous and genital regions. The relative abundance of fecal bacterial were higher in the perianal region (Figure 1).

FECAL BACTERIAL RELATIVE ABUNDANCE INCREASES WITH DIAPER DERMATITIS

As DD scores increased, the bacterial diversity remained unchanged while there was a shift downward in the relative abundance of Staphylococcus and upward in fecal associated bacteria (e.g., Enterococcus/ Lachnospiraceae). This was true when rash grades increased for each anatomical site (Figure 1 & Figure 4, left side).

FUNGAL COMPOSITION IS DIFFERENT BY ANATOMICAL REGION

Candida is more abundant on occluded areas (genital, intertriginous, and perianal) and least abundant on the buttocks (Figure 2).

CANDIDA RELATIVE ABUNDANCE INCREASES WITH DD IN THE INTERTRIGINOUS REGION

In the intertriginous region there is a trend toward higher Candida as rash grades increase. In the intertriginous regions there is a statistically significant shift toward Candida as DD increased to moderate-to-severe (rash grade 2 higher) (Figure 2 & Figure 4, right side).

DISCUSSION

The infant skin microbiome varies by anatomical site within the diapered area and with changes in skin health (DD). As expected, fecal bacterial strains were more common in the perianal region. However, in all regions the balance of Staphylococcus and fecal bacterial strains shifts when moderate-to-severe DD (rash grades > 2) is present (Figure 3). However, the question remains if the fecal bacteria are playing a role in skin irritation that results in DD or if they are just an indicator of the presence of feces, which is well-known to be irritating to the skin (Buckingham, 1986). Microbial swabs were taken at the chest, leg folds, genitals, perianal region, and diapered area, has ever exhibited hypersensitivity to topically applied skin care products. Other inclusion criteria: full time use of special skin care products, a systemic condition that requires ongoing medication, chronic dermatologic condition, or have taken any systemic medication within three months before enrollment.

CONCLUSION

This study begins to form a foundation to define the skin microbiome profile in the diapered area of the infant population. The infant skin microbiome varies by anatomical site within the diaper area and with changes in skin health (DD). These data may assist in understanding potential biological triggers for DD and potential opportunities to avoid DD.

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REFERENCES


Ellipses represent the 95% confidence interval around group centroids.