Improved Clinical and Quality of Life Assessments and Decreased S. aureus Colonization in Pediatric Subjects with Moderate to Severe Atopic Dermatitis after Daily Cleansing with a Uniquely-formulated Skin-friendly Topical Sodium Hypochlorite Body Wash

Benjamin R. Bohaty, MD†, Lina M. Rodriguez, MD‡, Kathryn C. Durham, MD†, Gil Abramovici, MD‡, Lori Asztalos, MD‡, Tanya Bhattacharya, BS†, Dennis P. West, PhD‡, Amy S. Paller, MD‡*, Adelaide A. Hebert, MD†*

†Department of Dermatology, The University of Texas Health Science Center at Houston, Houston, Texas
‡Department of Dermatology, Northwestern University Feinberg School of Medicine, Chicago, Illinois
*These authors contributed equally to the study
Disclosure

• Funding for this clinical trial was provided by TopMD Skin Care, Inc., Dallas, Texas. All funds for this research were paid to Northwestern University, Chicago, Illinois, and The University of Texas Medical School - Houston, Houston, Texas.
Background

• *Staphylococcus aureus* (*S. aureus*) colonization on both lesional and non-lesional skin is common in patients with atopic dermatitis (AD)\(^1,2\)

• *S. aureus* triggers inflammation and increases the severity of AD

• Measures to reduce *S. aureus* colonization, such as dilute sodium hypochlorite (bleach) baths, have been shown to decrease the clinical severity of AD in patients with secondary bacterial infection of the skin\(^3\)

• Common dilution regimen consists of \(\frac{1}{4}\) cup of household bleach in a half full tub of warm bath water (0.005% sodium hypochlorite concentration)\(^3\)

---

CLn Body Wash (TopMD Skin Care)

• A novel gel cleanser with a dilute concentration of sodium hypochlorite (0.006%) can be used in the shower or bath

• Lathered on and rinsed off after 1-2 minutes of skin contact

• May be a convenient alternative to dilute bleach baths
Objectives

• To evaluate the response of AD in infection-prone moderate-to-severe *S. aureus* colonized subjects who cleansed with CLn wash once daily

• To determine if CLn body wash is an effective alternative to bleach baths in patients who like to shower
Methods

- **Inclusion Criteria:**
  - 6 months-18 years of age
  - Moderate to Severe AD
  - Positive *S. aureus* skin cultures at screening

- **Exclusion Criteria:**
  - Active Infection and/or antibiotic use in the previous 4 week period
  - Bleach bath use in the previous 2 week period
Methods

- Subjects recruited from pediatric outpatient dermatology clinics in two large U.S. urban centers
- Subjects evaluated at 3 visits (Baseline, 2 Weeks, 6 Weeks)
- Assessments included:
  - Eczema Area and Severity Index (EASI)
  - Investigator Global Assessment (IGA)
  - Body Surface Area (BSA)
  - Pruritus Visual Analog Scale (VAS)
  - Children’s Dermatology Life Quality Index (CDLQI)
  - Family Dermatology Life Quality Index (FDLQI)
  - Patient Satisfaction Questionnaire (PSQ) for Problem Areas
- Target lesion S. aureus identified via bacterial culture and PCR analysis at baseline and 2 week visits
BLEACH ACTIVATES A REDOX-REGULATED CHAPERONE BY OXIDATIVE PROTEIN UNFOLDING

WINTER J, ILBERT M, GRAF PCF, OZCELIK D, JAKOB U
CELL 135:691-701, 2008
Staphylococcus aureus INHIBITS TERMINAL DIFFERENTIATION OF NORMAL HUMAN KERATINOCYTES BY STIMULATING INTERLEUKIN-6 SECRETION

DON ED, KHJ.PARK T, SHIN K, BAE IH, LIM KM, CHO EG, LEE TR
J OF DERMATOLOGICAL SCIENCES 2014
Figure 3. Bacterial taxonomic classifications in the AD skin microbiome. (A) Mean relative abundance of the 14 major phyla-order in the antecubital (Ac) and popliteal creases (Pc) for controls and AD disease states: baseline, flare (no-treatment [trt] and intermittent-trt), and postflare (Supplemental Table S13 for order of subjects). (B) Mean relative abundances for Ac and Pc of species-level classifications of staphylococcal species. Order of subjects follows A.
Bacterial taxonomic classifications in the AD skin microbiome vs healthy control

Kong HH. Genome Res 22(5) 2012 850-859
Stages of AD disease progression

- **Baseline w/ treatment:** high bacterial diversity, low Staphylococcal level
- **Pre-flare:** Staphylococcal levels increase, no worsening of clinical disease
- **Flare w/ no treatment:** low bacterial diversity, clinically worsened disease
- **Intermittent-treatment flare:** reduced *S. aureus* proportions and early restoration of microbial diversity, clinically worsened disease
- **Resolving flare:** restoration of full microbial diversity, low population levels of *Staphyloccocus*
Atopic Dermatitis microbiome progression hypothesis

Kong HH. Genome Res 22(5) 2012 850-859
Skin microbiota: a source of disease or defence?

Cogen AL
Br J Dermatol 158(3) 2008 442-455
Bacterial community variation in human body habitats across space and time

Costello EK
Science 326(5960) 2009 1694-1697
Skin microflora and bacterial infections of the skin

Chiller K

J Investig Dermatol Symp Proc 6(3) 2001
170-174
Characterization of skin microbiota in patients with atopic dermatitis and in normal subjects using 16S rRNA gene-based comprehensive analysis

Dekio I

J Med Microbiol 56(Pt 12) 2007 1675-1683
Microbiome composition on normal-appearing human skin

Chen YH. J Am Acad Dermatol 69(1) 2013 143-55
The skin microbiome: Current perspectives and future challenges

Chen YE

J Am Acad Dermatol 69(1) 2013 143-55
Microbiome of the Atopic Dermatitis Patient

- AD’s hallmark is the chronic, recurrent flaring of intensely itchy skin
- AD is associated with *Staphylococcus aureus* skin colonization or infection & managed w/ regimens that include antimicrobial therapy
- AD preferentially involves sites that harbor similar groups of organisms and share distinct compositions of microbial communities
  - e.g. antecubial and popliteal regions
- Microbial communities contribute to predilections of some dermatologic disorders for stereotypical sites
• AD disease states are characterized by concurrent and anticorrelated shifts in microbial diversity & proportion of *Staphylococcus*

• Strong association between worsening disease severity and lower skin bacterial diversity

• Increases in the proportion of *Staphylococcus* and reductions in microbial diversity precede worsening of AD disease severity
Results

- The cohort included **50** subjects
  - 60.0% male
  - Mean age 8.19±9.31 yrs
Results

% Mean Reduction from Baseline

Percent mean decrease in EASI, BSA and IGA at 2 weeks and 6 weeks post-treatment with sodium hypochlorite wash.
Results

% Mean Decrease in CDLQI, FDLQ, VAS and PSQ

Percent mean decrease in CDLQI, FDLQI, Pruritus VAS and PSQ for pruritus at 2 weeks and 6 weeks post-treatment with sodium hypochlorite wash.
**Results**

Percent of patients who tested positive for the presence of *Staphylococcus aureus* during bacterial culture of lesion swab at baseline and 2 weeks.

Percent of patients who tested positive for the presence of *Staphylococcus aureus* during PCR analysis of lesion swab at baseline and 2 weeks.
Results

Atopic dermatitis of the dorsal hand and popliteal fossa at baseline (A) and 6 weeks (B) post-treatment with sodium hypochlorite wash.
AFTER
MEDIATED SKIN DISEASE IN MICE

LEUNG TH

J CLIN INVEST 2013; 123 (12) 5361 - 5370
Conclusions

• Use of a sodium hypochlorite-formulated body wash led to significant decreases in mean IGA, EASI, BSA, Pruritus VAS, CDLQI, and FDLQI scores, as well as the number of problem areas on the PSQ at 2 and 6 weeks of use.

• A reduction in the percentage of patients testing positive for S. aureus by bacterial culture and PCR analysis was observed after 2 weeks of wash use.

• CLn body wash represents a simple and effective alternative to bleach bath use.
Questions?
Eczema Area and Severity Index (EASI)

- Tool used to measure severity and extent of AD.
- Four body regions examined:
  - Head and neck
  - Upper limbs
  - Trunk
  - Lower limbs severity of four factors:
- Multiplied by severity of four factors:
  - Redness (erythema)
  - Thickness (induration)
  - Scratching (excoriation)
  - Lichenification
Body Surface Area (BSA)

- Measures area of involvement with a standard pediatric calculation sheet
Investigator Global Assessment (IGA)

- 6 point static assessment of a patient’s disease state at the time of examination
  - 0 = clear
  - 1 = almost clear
  - 2 = mild disease
  - 3 = moderate
  - 4 = severe
  - 5 = very severe
Pruritus Visual Analog Scale (VAS)

• Scale asks the patient to place a pen stroke on a vertical line to show how the itch has been in the past 7 days

• Ranges from No Itch to Worst Itch Imaginable

How severe has your itch been in the last 7 DAYS?
(Please place a vertical stroke on the line below to show how your itch has been.)

NO ITCH ➞ WORST ITCH IMAGINABLE
Quality of Life Indices

Child’s Dermatology Life Quality Index (CDLQI)

- Asks the child questions that relate to the impact of their skin disease regarding discomfort, worry, depression, embarrassment, frustration, and sleep disturbance over the past week.

Family’s Dermatology Life Quality Index (FDLQI)

- Measure of the family’s quality of life and the impact of AD in the last month.
Patient Satisfaction Questionnaire (PSQ)

• PSQ for Problem Areas asks the patient to check any of 12 areas of their body that have been a problem in the past 7 days.