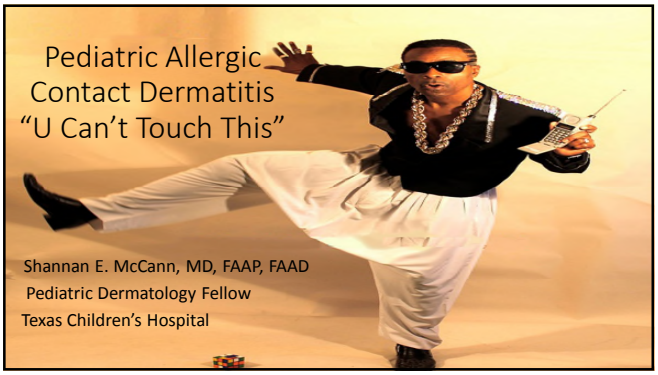
Pediatric Allergic Contact Dermatitis "U Can't Touch This"



Shannan E. McCann, MD, FAAP, FAAD
Pediatric Dermatology Fellow
Texas Children's Hospital

DISCLOSURE OF RELEVANT RELATIONSHIPS WITH INDUSTRY

Shannan E. McCann, MD
Pediatric Dermatology Fellow

I do not have any relevant relationships with industry

OBJECTIVES

Identify and evaluate the **most common causes of contact dermatitis** in the pediatric population

Appropriately **counsel parents on avoidance** of contact allergens in the pediatric population

Clinical Features

Acute → blistering and weeping

(1)

(2)

Chronic → lichenified or scaly plaques

PRURITIC!

(1) http://www.zizaidermatology.com
(2) Lio, 2007

Most Common Types of Contact Dermatitis

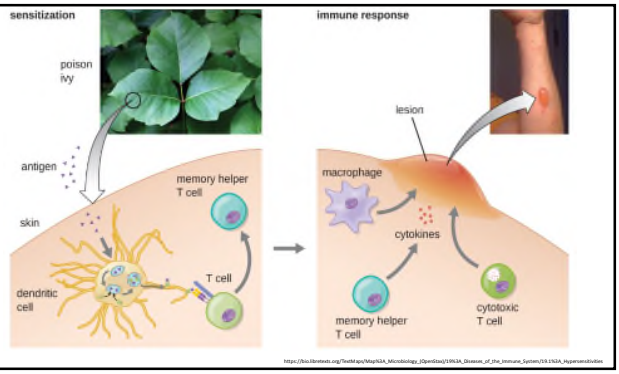
Irritant

- Most common
- Saliva, urine, feces, cleaning products, sanitizers
- Burning, stinging, some pruritis
- Direct cytotoxic effect
- Dependent on amount and duration of substance
- Occurs in everyone with correct amount of exposure
- Reaction remains localized to site of contact

Allergic

- Current prevalence in general pediatric population up to 24% (1)
- Poison ivy, nickel, lanolin
- Very pruritic
- Type IV Hypersensitivity
- Requires prior exposure and sensitization
- Small amount can cause reaction
- Reaction can spread beyond the borders of the contact

(1) Jacob et al, 2008



Toxicodendron Plants

- Family Anacardiaceae Genus Toxicodendron
  - Poison ivy, oak, sumac
- Contains the allergen, urushiol
- Allergens can cross reacts with:
  - Japanese Japanese lacquer tree
  - Can Cashew nut tree
  - Grow Gingko (seeds)
  - Indian Indian marking nut tree
  - **Mangos** in **Mango (avoid contact with the rind)**
  - Brazil Brazilian pepper tree – aka Florida holly

Toxicodendron Dermatitis

- Symptoms typically within 4-96 hours, last 2-3 weeks (1)
- Erythema and pruritis-> papules, plaques, vesicles, bullae often linear
- Face or genital involvement can have significant edema
- Black spot dermatitis
  - Oxidized urushiol on the skin -> black dots
- Dried black antigenic resin can remain on contaminated clothing, pet fur/claws, gardening tools, under fingernails, toys for days

(1) James, 2016

Treatment of Toxicodendron Dermatitis

- Early: Entire body washed with copious amounts of water
- Early Treatment: Within 1-2 hours, forceful unidirectional washing with a damp washcloth and liquid dishwashing soap. Washcloth should be applied with repetitive, high-pressure, single-direction wipes under hot, running water for three rounds of about three minutes (1)
- Wash fingernails
- After 10 minutes, only 50% removed, after 60 minutes, none removed (2)

(1) Neill, 2018
(2) Fisher, 1996

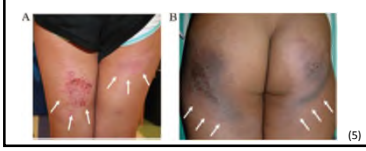
Treatment of Toxicodendron Dermatitis

- Weepy acute lesions best treated with wet to dry soaks such as Burow's Solution (aluminum acetate) or calamine lotion
- High potency topical steroids if prior to vesicles/blisters
- Systemic steroids at 1-2 mg/kg/day gradually tapered over 3 weeks given high risk of rebound
- Zanfel®- significantly relieves itch and erythema
- Several OTC pre-exposure preventative products

Heilig, 2011

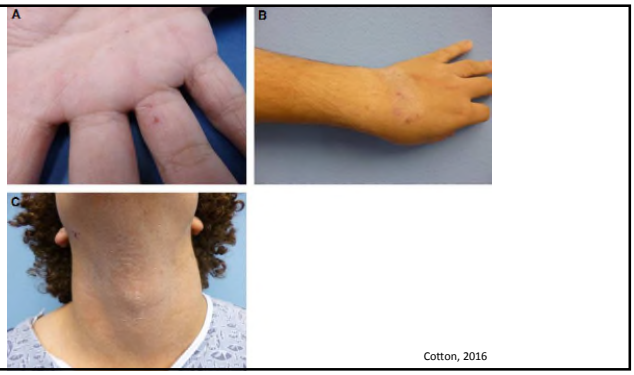
More on Toilet Seat Dermatitis

- Wooden toilet seat varnish (1), wood (2)
- Polyurethane toilet seats (3) or polypropylene toilet seats (4)
- Commonly irritant reactions from cleaning solutions (4, 5)
  - Irritant reactions healed with copious rinsing of seats with water, toilet seat covers, topical corticosteroids, petroleum jelly



(5)

(1) Raison-Peyron, 2013
(2) Ezzedine, 2007
(3) Turan, 2011
(4) Heilig, 2011
(5) Litvinov, 2010



Cotton, 2016

TABLE 1. *Positive Patch Test Reactions and Their Clinical Relevance in Our Patient*

Allergen	Reaction	Relevance
Nickel	1+	Definite current relevance (e.g., nickel-backed watch, coins)
Cobalt	1+	Probable current relevance (metal jewelry, coins)
Gold	1+	Probable current relevance (metal jewelry, coins)
Potassium dichromate	1+	Probable current relevance (leather bracelet, leather couch)
Carbamate	1+	Probable current relevance (rubberized coin storage albums)
Balsam of Peru	1+	Probable past relevance (personal hygiene products, benzoate-based preservatives, not found in his current fragrance-free products)
Methylisochlorothiazolinone/ methylisothiazolinone	1+	Probable past relevance (personal hygiene products, not found in his current products)
Parthenolide (*Compositae*)	1+	Possible clinical relevance (personal hygiene products, airborne exposure)
Bronopol	1+	Probable past relevance (personal hygiene products, not found in his current products)

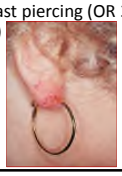
Cotton, 2016

In Order to Diagnose ACD…

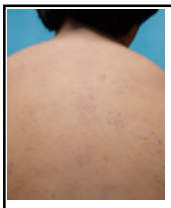
1. First consider the possibility!
2. Ask the right questions
   - Exposures both at home and school; explore hobbies and activities
   - Effect of time away (vacations)
   - Ask about all personal care products
3. Perform a thorough exam paying attention to location

Nickel Dermatitis

- In the US, combined direct and indirect costs of nickel dermatitis- $5.7 billion/year (1)
- Sensitization through jewelry, clothing snaps, coins, toys, electronics, razors, belt buckles
- Nickel allergy and female sex (OR 5.19), past piercing (OR 3.86) and currently having ≥3 piercings (OR 5.58) (2)
- Can *usually* wear stainless steel, platinum, titanium, or gold (NOT white gold)
- Dimethylglyoxime test



(1) Jacob, 2015
(2) Schuttelaar, 2018



(1)

(3)

(2)

(4)

Consider Nickel:
- Clothing fasteners
- Ear piercings
- Nickel-containing dental work
- Laptops
- Razors
- Wind-up toys
- Video game controllers (1)

(1) Jacob, 2014
(2) Johnson, 2013
(3) Hunt, 2014
(4) Berk, 2011

10 year old with history of Atopic Dermatitis

(1) Kaur 2017

Allergic Contact Dermatitis Provokes Atopic Dermatitis

- Important to consider a contact dermatitis, especially with a refractory dermatitis and those diagnosed with atopic dermatitis
- Atopic dermatitis predisposes patients via multiple mechanisms to developing allergic contact dermatitis
- 1142 children patch-tested found those with AD had statistically increased frequency of positive tests to **cocamidopropyl betaine, wool alcohol, lanolin, tixocortol, and parthenolide** (1)
  - **Significant reactions to allergens in their skin care preparations**

(1) Jacob, 2017

But…

- "I've been using the same product for years and I didn't change anything before this rash started."
- Everyone's immune system is unique and may require a certain number of exposures to become sensitized to a specific allergen.

Image from Shutterstock

But…

- "I've changed everything since the rash started."
- Most types of products are made using similar ingredients; so even if you've changed your moisturizer, you're probably still being exposed to the same allergen.

Image from http://www.andreaharrn.co.uk

Commonly Sensitized Allergens in Pediatrics

- **Nickel**
- **Neomycin** 10% of population
- **Bacitracin** sensitivity (1.5- 9.1%)
- **Tixocortol-21-pivalate**- tested substance for hydrocortisone
- **Budesonide**- Corticosteroid in the triamcinolone group
  - Desoximethasone least allergenic
- Personal care products
  - **Balsam of Peru** (*Myroxylon pereirae*)- diaper balms, wound ointments, liquid adhesives, mouthwash, toothpaste
  - **Formaldehyde and formaldehyde-releasing preservatives**- personal care and cleaning products
  - **Cocamidopropyl betaine**- shampoos, bath products, cleansers
  - **Fragrances** (Mix I and II)

Pelletier 2016
Jacob, 2014
Image from dermatlas.org

Commonly Sensitized Allergens and Sources in the Pediatric Population

- **Potassium dichromate**- tanning agent in leather
- **Cocamidopropyl betaine**- shampoo, cleanser
- **Lanolin alcohol**- emollient
- **Propylene glycol**- preservative, solvent/moistening agent
- **Compositae mix/dandelion extract**- ragweed family plant
- **Cobalt Chloride-** metal
- **Quaternium 15**- preservative, formaldehyde releaser
- **Methylchloroisothiozolinone/ methylisothiozolinone**- preservative
- **Carba mix**- rubber accelerator
- **Disperse dyes** (blue 124/106, yellow 3/9)
- **Colophony-** adhesives, topical medications

Pelletier, 2016

Cornerstone of Prevention is to Avoid Potential Sensitizers

- Allergen sensitization identified in 24.5% of 6 month to 5 year olds (1)
- No government/industry standard for products that are “safe for babies”
- Hypoallergenic Baby Products
  - Bonchak JG. Prevalence of Contact Allergens in Personal Care Products for Babies and Children. *Dermatitis*. 2018 Mar/Apr;29(2):81-84.
- https://www.doctorkatta.com/handouts
- Consider connubial dermatitis
- “Unscented” products may contain a masking fragrance
- “Fragrance-free” products may contain fragrance ingredients used for other purposes

(1) Bruckner, 2000
(2) Bonchak, 2018

Repeat Open Application Test (ROAT)

- Apply the product to non-diseased skin such as upper arm, antecubital fossa, or flexor forearm BID for 1-2 weeks
- Allergic response typically in 2-4 days
- Does not identify specific allergen
- Other products may contain the same allergen
- Regional skin reactivity, exposure dose, time of exposure, percutaneous penetration or involvement of diseased skin can affect the reactivity of the skin

Mowad, 2016
Bolognia, 2012
Image from Spiewak, 2008

Patch Testing Indications

- Worsening of a previously stable dermatitis*
- Dermatitis that is unresponsive to treatment*
- Distribution highly suggestive for ACD*
- Clinical history highly suggestive for ACD
- Dermatitis of unknown etiology
- Cutaneous eruption from systemic exposure to an allergen

Mowad, 2016

Patch Testing

- Gold standard for diagnosis
- Overall, sensitivity 70% and specificity 80%
- Over 4350 chemicals identified as contact allergens (1)
- TRUE Test safe and effective in 6-18 year olds (2)
  - Only FDA-approved diagnostic tool down to age 6 years for ACD
  - 35 allergens and 1 control
- Minimum basic 20-allergen patch test series specifically targeted for pediatrics (3)
  - Recommended but not in TRUE Test: Cocamidopropyl betaine, compositae mix/dandelion extract, Disperse Blue 124, Fragrance II, propylene glycol

(1) Mowad, 2016
(2) Jacob, 2011
(3) Jacob, 2014

TRUE Test

Panel 1.3	Panel 2.3	Panel 3.3
Nickel Sulfate	p-tert-Butylphenol Formaldehyde Resin	Diazolidinyl Urea
Wool Alcohols	Epoxy Resin	Quinoline Mix
Neomycin Sulfate	Carba Mix	Tixocortol-21-Pivalate
Potassium Dichromate	Black Rubber Mix	Gold Sodium Thiosulfate
Caine Mix	CI+ Me- Isothiazolinone (MCI/MI)	Imidazolidinyl Urea
Fragrance Mix	Quaternium-15	Budesonide
Colophony	Methyldibromo Glutaronitrile	Hydrocortizone-17-Butyrate
Paraben Mix	p-Phenylenediamine	Mercaptobenzothiazole
Negative Control	Formaldehyde	Bacitracin
Balsam of Peru	Mercapto Mix	Parthenolide
Ethylenediamine Dihydrochloride	Thimerosal	Disperse Blue 106
Cobalt Dichloride	Thiuram Mix	Bronopol

But…

"I purchased an all natural organic moisturizer but still itch"

- **Botanicals are particularly difficult to test because of the lack of adequate screening series and the number of allergens is extensive (1, 2).**
- **Increasingly common in organic all natural products, including baby products (3).**
- **Term does not correlate with truly hypoallergenic.**

(1)Mowad, 2016
(2)Simpson, 2004
(3) Yu, 2016

International Contact Dermatitis Research Group Scoring System

- (-) negative reaction
- (?+) doubtful reaction with fait erythema only
- (1+) Weak positive reaction with nonvesicular erythema, infiltration, possibly papules
- (2+) Strong positive reaction with vesicular erythema, infiltration, and papules
- (3+) Extreme positive reaction with intense erythema and infiltration, coalescing vesicles, bullous reaction
- (IR) Irritant reaction
- (NT) Not tested

?+

1+

2+

3+

IR

Resources for Allergen Information

- www.mypatchlink.com- free videos describing certain allergens
- www.chemotechnique.se- patient handouts
- www.truetest.com- patient handouts
- www.allergyfreeeskin.com- patient handouts
- ASCD Contact Allergen Replacement Database (CARD)- patient handouts
- www.contactderm.org (American Contact Dermatitis Society)
  - Find a physician
  - Allergen Handouts- Contact Allergen Management Program (CAMP)
- https://www.doctorkatta.com/handouts- patient handouts
- Marks JG, Elsner P, Deleo VA. Contact and Occupational Dermatology. St Louis:Mosby 2002.- patient handouts

References

- Berk DR, Bayliss SJ. Cellular phone and cellular phone accessory dermatitis due to nickel allergy: report of five cases. *Pediatr Dermatol.* 2011;28:327-331.
- Bolognia J, Jorizzo J, Schaffer J. Dermatology. 3rd ed. Saunders, 4th Junt 2012.
- Bonchak JG, Prouty ME, de la Feld. Prevalence of Contact Allergens in Personal Care Products for Babies and Children. *Dermatitis.* 2018 Mar/Apr;29(2):81-84.
- Browne F, Wilkinson SM. Effective prescribing in steroid allergy: controversies and cross-reactions. *Clin Dermatol* 2011 May-Jun; 29(3):287-94.
- Bruckner AL, Weston WL, Morelli JG. Does sensitization begin in infancy? *Pediatrics* 2000;105;e3.
- Clayton TH, Wilkinson SM, Rawcliffe C, et al. Allergic contact dermatitis in children: should pattern of dermatitis determine referral? A retrospective study of 500 children tested between 1995 and 2004 in one U.K. center. Br J Dermatol. 2006; 154:114.
- Cotton CH, Admani SE, Jacob SE, *et al*. Mint Condition: Contact Dermatitis in an adolescent numismatist. *Pediatr Dermatol*. 2016 Jan-Feb;33(1):80-3.
- Ezzedine K, Rafii N, Heenen M. Lymphomatoid contact dermatitis to an exotic wood: a very harmful toilet seat. *Contact Dermatitis* 2007;57:128-130.

References

- Fisher AA. Poison Ivy/oak dermatitis. Part I:prevention- soap and water, topical barriers, hyposensitization. *Cutis* 1996; 57:384-386.
- Heilig S, Adams DR, Zaenglein AL. Persistent allergic contact dermatitis to plastic toilet seats. *Pediatr Dermatol* 2011 Sep-Oct;28(5):587-90.
- https://bio.libretexts.org/TextMaps/Map%3A_Microbiology_(OpenStax)/19%3A_Diseases_of_the_Immune_System/19.1%3A_Hypersensitivities last updated December 2017 and accessed 17 April 2018.
- Hunt RD, Feldstein SI, Krakowski AC. Itching to learn: school chair allergic contact dermatitis on the posterior thighs. *J Clin Aesthet Dermatol* 2014 Apr;7(4):48-9.
- Jacob SE, Admani S. iPAD-Increasing nickel exposure in children. *Pediatrics* 2014; 134;e580.
- Jacob SE, Admani S, Herro EM. Invited commentary: recommendation for a North American pediatric patch test series. *Curr Allergy Asthma Rep* 2014;14(6):444.
- Jacob SE, Brod B, Crawford GH. Clinically relevant patch test reactions in children--a United States based study. *Pediatr Dermatol* 2008 Sep-Oct;25(5):520-7.
- Jacob, SE, Goldenberg A, Pelletier JL, *et al.* Nickel allergy and our children's health: a review of indexed cases and a view of future prevention. *Pediatr Dermatol*. 2015; 33(6):605-612.

References

- Jacob SE, Herro EM, Sullivan K *et al*. Safety and efficacy evaluation of TRUE Test panels 1.1, 2.1, and 3.1 in children and adolescents. *Dermatitis*. 2011;22(4):204-210.
- Jacob SE, McGowan M, Silverberg NB *et al*. Pediatric contact dermatitis registry data on contact allergy in children with atopic dermatitis. *JAMA Dermatol* 2017 Aug; 153(8):765-780.
- James WD, Berger TG, Elston DM. Andrew's Diseases of the skin, 12th ed. Elsevier 2016.
- Johnson EF, Lau EG, Smidt AC. Picture of the Month. Allergic contact dermatitis to nickel-containing dental work. JAMA Pediatr 2013;167(6):581-582.
- Kaur S, Vasar M. Contact Allergy to the ingredients of moisturizers in a boy with atopic dermatitis. *Contact Dermatitis* 2017 (76):180-81.
- Lio PA. Atopic dermatitis and food allergies: true, true and related? *Archives of Disease in Childhood - Education and Practice* 2007;**92:**ep56-ep60.
- Litinov IV *et al.* Recognizing and treating toilet-seat contact dermatitis. *Pediatrics* 2010;125:3419-422.
- Mowad CM, Anderson B, Scheinman P et al. Allergic contact dermatitis. *J Am Acad Dermatol* 2016;74(6):1029-1055.
- Neill BC, Neill JA, Brauker J, et al. Post-exposure prevention of toxicodendron dermatitis with early forceful unidirectional washing. *J Am Acad Dermatol.* 2018 Feb 1. pii: S0190-9622(18)30171-3.

References

- Pelletier JL, Perez C, Jacob SE. Contact dermatitis in pediatrics. *Pediatr Ann*. 2016 Aug 1;45(8):e287-92.
- Raison-Peyron N, Nilsson U, Du-Thanh A *et al*. Contact Dermatitis From Unexpected Exposure to Rosin From a Toilet Seat. *Dermatitis*. 2013 May-Jun;24(3):149-50.
- Schuttelaar MLA, Ofenlock RF, Bruze M, *et al*. Prevalence of contact allergy to metals in the European general population with a focus on nickel sulfate and piercings: The EDEN Fragrance Study. *Contact Dermatitis.* 2018 Apr 10.
- Simpson EL, Law SV, Storrs FJ. Prevalence of botanical extract allergy in patients with contact dermatitis. *Dermatitis.* 2004;15(2):67-72.
- Spiewak R. Patch testing for contact allergy and allergic contact dermatitis. *The Open Allergy Journal* 2008. 9(1):42-51.
- Turan H, Saricaoglu H, Turan A, et al. Polyurethane Toilet Seat Contact Dermatitis. *Pediatr Dermatol*. 2011 Nov-Dec;28(6):731-2.
- Warshaw EM, Aschenbeck KA, DeKoven JG *et al*. Epidemiology of pediatric nickel sensitivity: retrospective review of North American Contact Dermatitis Group (NACDG) data 1994-2014. *J Am Acad Dermatol.* 14 Apr 2018.
- Yu J, Treat J, Chaney K et al. Potential allergens in disposable diaper wipes, topical diaper preparations, and disposable diapers: under regcognized etiology of pediatric perineal dermatitis. *Dermatitis.* 2016;27(3):110-118.

Diaper creams and ointments		
Brand	Product Name	Price per ounce
Aquaphor	Aquaphor Baby Diaper Rash Cream	$2.28
Attitude	Attitude Little Ones Baby Diaper Cream Zinc Fragrance Free	$7.69
Avalon Organics	Avalon Organics Protective Zinc Diaper Balm	$2.82
Babo Botanicals	Babo Botanicals Soothing Diaper Cream	$4.00
Babyganics	Babyganics Diaper Rash Cream	$2.00
Butt Naked Baby	Butt Naked Baby Protective Diaper Balm	$3.53
CeraVe	CeraVe Baby Diaper Rash Cream	$2.66
Little Twig	Little Twig Organic Diaper Cream Extra-Mild Unscented	$5.12
Motherlove	Motherlove Diaper Rash & Thrush	$9.95
Oh my devita Baby	Oh my devita Baby Butter Cheeks Diaper Balm	$18.97
Tom's of Maine	Tom's of Maine Baby Diaper Cream Fragrance Free	$3.66
Vanicream	Vanicream Diaper Rash Ointment	$3.60

Bonchak, 2018

Moisturizers		
Brand	Product Name	Price per ounce
Attitude	Attitude Little Ones Baby Body Lotion	$1.30
Aveeno	Aveeno Baby Daily Moisture Lotion Fragrance Free	$1.57
Babyganics	Babyganics Moisturizing Daily Lotion Fragrance Free	$0.59
Burt's Bees	Burt's Bees Baby Bee Lotion Fragrance Free	$1.83
Burt's Bees	Burt's Bees Baby Bee Nourishing Lotion Fragrance Free	$1.33
California Baby	California Baby Super Sensitive Everyday Lotion No Fragrance	$1.66
CeraVe	CeraVe Baby Lotion Fragrance Free	$1.58
Exederm	Exederm Hydrating Baby Lotion	$2.00
Exederm	Exederm Intensive Baby Moisturizer	$3.00
Natures Baby Organics	Natures Baby Organics Organic Face & Body Moisturizer Fragrance Free	$1.50
SheaMoisture	SheaMoisture Baby Healing Lotion Fragrance Free	$1.00
Tom's of Maine	Tom's of Maine Baby Lotion Fragrance Free	$1.83
Yes to Baby Carrots	Yes to Baby Carrots Nourishing Baby Lotion	$1.18

Bonchak, 2018

Soap and Shampoo		
Brand	Product Name	Price per ounce
Aveeno	Aveeno Baby Cleansing Therapy Moisturizing Wash Fragrance Free	$2.87
Babyganics	Babyganics Shampoo & Body Wash Fragrance Free	$0.69
Babyganics	Babyganics Moisturizing Therapy Cream Wash Fragrance Free	$1.00
Burt's Bees	Burt's Bees Baby Bee Shampoo & Wash Fragrance Free	$2.67
California Baby	California Baby Super Sensitive Shampoo & Bodywash No Fragrance	$0.99
CeraVe	CeraVe Baby Wash & Shampoo	$1.49
Oh my devita Baby	Oh my devita Baby Bubbly Babies Bodywash and Shampoo Fragrance Free	$1.66
SheaMoisture	SheaMoisture Baby Wash & Shampoo Fragrance Free	$0.61
Tom's of Maine	Tom's of Maine Baby Shampoo & Wash Fragrance Free	$1.07

Bonchak, 2018

Sunscreen		
Brand	Product Name	Price per ounce
Aveeno	Aveeno Baby Continuous Protection Sunscreen Lotion SPF 55	$2.50
Babyganics	Babyganics Cover-Up Baby Sunscreen Spray SPF 50+	$2.17
Banana Boat	Banana Boat Baby Sunscreen Lotion SPF 50	$1.25
Banana Boat	Banana Boat Kids Continuous Spray Sunscreen SPF 50	$1.77
Blue Lizard	Blue Lizard Baby Australian Sunscreen SPF 30+	$3.40
California Baby	California Baby Everyday/Year Round Moisturizing Sunscreen SPF 18+	$4.40
Cotz	CoTZ Pediatric Sunscreen SPF 40	$5.71
Episencial	Episencial Sunny Sunscreen SPF 35 Unscented	$4.81
Neutrogena	Neutrogena Pure and Free Baby Faces SPF 45+	$4.40

Bonchak, 2018

Wipes		
Brand	Product Name	Price per wipe
Babyganics	Babyganics Flushable Wipes	$0.08
Babyganics	Babyganics Face Hand & Baby Wipes Fragrance Free	$0.05
Dr. Brown's	Dr. Brown's Nose & Face Wipes Naturally Soothing with Calendula	$0.11
Earth's Best	Earth's Best TenderCare Chlorine Free Baby Wipes	$0.08
Seventh Generation	Seventh Generation Original Soft & Gentle Baby Wipes 5 pk Free & Clear	$0.04
Seventh Generation	Seventh Generation Thick n' Strong Baby Wipes	$0.05
WaterWipes	WaterWipes Baby Wipes Value Pack 4 pk	$0.05

Bochak, 2018