

Dirty Laundry: Detergent Pod Ocular Burns Among Pediatric Patients

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Abstract:

A 3-year-old female presented for evaluation and management of an ocular chemical burn of the left eye following exposure to concentrated detergent from a ruptured detergent pod. After thorough irrigation, initial ophthalmic examination demonstrated significant corneal epithelial loss, surface irritation, and a periorbital skin burn. The patient's ocular burn was managed with topical antibiotics and resolved within 1 week without any residual ocular sequelae.

Case Study:

History:

A 3-year-old otherwise healthy female presented to the Medical College of Georgia Augusta University Medical Center for evaluation of a left chemical ocular burn. The patient was reportedly in the care of her great-grandmother and was found playing with a Tide detergent pod (Procter & Gamble) which subsequently burst and splashed concentrated liquid detergent into her left eye. Since the incident, the patient has been forcibly closing her left eye due to discomfort.

Examination:

Upon arrival to the Emergency Department, pH testing of the left ocular surface revealed an essentially neutral pH of ~7.5. The left eye was irrigated with 500 mL of normal saline, and repeat pH testing was ~7.0. At the time of ophthalmology referral, the patient exam was limited by poor cooperation. Visual acuity was fixes/follows bilaterally, the pupils were bilaterally equal with no relative afferent pupillary defect, tonometry was normal in both eyes by digital estimation, and extraocular motility was grossly full with normal alignment. The external exam demonstrated mild periorbital erythema with a small superficial skin burn inferolateral to the lateral canthus. Pen light examination was notable for moderate conjunctival injection and a central epithelial corneal defect of ~70% corneal area in the left eye (Figure 1). There was no apparent limbal blanching to suggest ischemia. The anterior segment exam of the right eye was unremarkable. Dilated posterior segment examination was deferred at this time.

Discussion and Diagnosis:

Laundry detergent packs, which consist of water soluble pouches containing highly concentrated detergent, have been marketed as a convenient, single-use, dosed units of laundry detergent for household use. These products have been available in Europe since 2001, but were more recently popularized in North America by Procter & Gamble with their introduction of Tide PODS® in 2012. Since their debut, other major laundry brands have also launched competitive products.

Many detergent pod designs feature bright colors, which may be tempting to young children (Figure 2). Consequently, the appearance of these products has met scrutiny by both the lay and medical communities alike. The visual appeal and fragile nature of these products has been implicated in the rise of associated pediatric injuries through various routes including ingestion, inhalation, aspiration, dermal and ocular exposures, or some combination thereof¹. According to the Centers for Disease Control (CDC) using data from the National Poison Data System (NPDS), detergent pod exposure is most common in children ≤ 5 , who account for more than 90% of cases². More specifically, 1- and 2-year-olds account for nearly two thirds of exposures¹.

Ocular injuries comprise a significant portion of detergent pod exposure injuries in the pediatric population. Epidemiologic studies suggest ocular involvement in at least 13% of all detergent pod exposures, with isolated ocular involvement in roughly 7% of cases¹. Other studies report that 20% of all exposures may have some degree of ocular involvement³. Data from the National Electronic Injury Surveillance System (NEISS) demonstrated that the incidence of detergent pod-related ocular injuries increased more than 30-fold between 2012 and 2015 among 3-4-year-olds in the US⁴. Detergent pod ocular injuries furthermore represent a significant portion of all ocular chemical injuries in the US, accounting for 26% in 2015⁵.

Detergent pod-associated ocular injuries are nearly universally associated with conjunctival injection and significant loss of corneal epithelium. Reports of incidence of corneal epithelial defects in published case series range from 58% -100%, with total epithelial loss reported in some cases^{3,6-8}. Chemosis and eyelid edema are less commonly reported. In nearly all instances, there are no long term ocular sequelae, with symptoms typically resolving within a week of initial injury with use of topical antibiotics for infection prophylaxis, and no reports of limbal ischemia^{3,6-9}.

Chemical burn injuries represent ophthalmologic emergencies that may result in blindness in some instances. Alkali injuries are typically more devastating than acidic injuries as bases penetrate more deeply into the anterior segment than acids, which are more readily bound by corneal proteins¹⁰. Chemical composition varies by manufacturer, but most detergent pods contain liquid of neutral to weakly alkaline pH¹¹. There are exceptions however, as at least one commercial product has a documented pH of 8.7 as per the material safety data sheet (MSDS)¹². The exact mechanism of tissue injury with detergent pods is not entirely elucidated, but thus may be primarily due to the effect of its surfactants (ethoxylated alcohols, alkylbenzene sulfonate, propylene glycol etc.) rather than pH¹³. Others have hypothesized that the pressure of liquid erupting from the capsule contacting the ocular surface may be responsible⁹. Regardless of the mechanism, as with all ocular chemical exposures, copious irrigation with tap water or another neutral isotonic fluid is recommended in cases of detergent pod-related ocular burns in order to minimize ocular injury.

Following irrigation, our patient was started on aggressive lubrication with topical erythromycin ointment four times per day. She was additionally started on topical moxifloxacin drops four times per day for broader antimicrobial prophylaxis. The following day after the injury, the

corneal epithelial defect was noted to have reduced by roughly 50%, with improving conjunctival injection. Two days later there was just a trace residual epithelial defect remaining. At one week follow-up, there were no residual anterior segment abnormalities although there was still resolving periocular skin burn. Dilated posterior segment examination was performed at this time and was normal bilaterally. The patient was discharged to routine outpatient follow-up.

Conclusion:

Since their introduction, laundry detergent pods have emerged as a new common cause of ocular burn injuries. The pediatric population is particularly susceptible to these injuries. As with all chemical ocular injuries, immediate, copious irrigation of the ocular surface is indicated to minimize the risk of damage. Most of these injuries are limited to corneal epithelial loss and surface irritation and as such resolve within a few days without long-term sequelae.

References

1. Valdez AL, Casavant MJ, Spiller HA, Chounthirath T, Xiang H, Smith GA. Pediatric Exposure to Laundry Detergent Pods. *Pediatrics*. 2014;134(6):1127.
2. Centers for Disease Control and Prevention (CDC). Health Hazards Associated with Laundry Detergent Pods- United States, May - June 2012 *MMWR Morb Mortal Wkly Rep*. 2012;61(41).
3. Mathew RG, Kennedy K, Corbett MC. Wave of paediatric eye injuries from liquid detergent capsules. *BMJ*. 2010;340:c1186.
4. Haring RS, Sheffield ID, Frattaroli S. Detergent Pod-Related Eye Injuries Among Preschool-Aged Children. *JAMA Ophthalmol*. 2017;135(3):283-284.
5. Halpern LW. Laundry Detergent Pods Linked to Increased Eye Injuries in Children. *Am J Nurs*. 2017;117(5):15.
6. Gray ME, West CE. Corneal injuries from liquid detergent pods. *J AAPOS*. 2014;18(5):494-495.
7. Breazzano MP, Day HR, Jr., Tanaka S, Tran U. Prospective analysis of pediatric ocular chemical burns: laundry detergent pods. *J aapos*. 2018;22(6):426-428.
8. Lasnier O, El-Hadad C, Superstein R. Two cases of corneal abrasions in children exposed to liquid detergent capsules. *Can J Ophthalmol*. 2013;48(2):e29-30.
9. Fayers T, Munneke R, Strouthidis NG. Detergent capsules causing ocular injuries in children. *J Pediatr Ophthalmol Strabismus*. 2006;43(4):250-251.
10. Dua HS, King AJ, Joseph A. A new classification of ocular surface burns. *British Journal of Ophthalmology*. 2001;85(11):1379.
11. Malpass P. Do not assume strong alkalinity. *BMJ*. 2010;340:c2399.
12. Henkel. Material Safety Data Sheet: Purex UltraPacks Liquid Laundry Detergent-ColdWater *The Henkel Company* 2018.
13. Beuhler MC, Gala PK, Wolfe HA, Meaney PA, Henretig FM. Laundry detergent "pod" ingestions: a case series and discussion of recent literature. *Pediatr Emerg Care*. 2013;29(6):743-747.



Figure 1. External photograph of a child's left eye which sustained ocular burn following detergent pod exposure.

Illumination using the blue cobalt filter from an indirect ophthalmoscope demonstrates a large corneal epithelial defect. A superficial skin burn is present beneath the lateral lower eyelid. *Photo courtesy of Luke Chang, MD.*



Figure 2. External photograph of a liquid laundry detergent pod available in the United States. This particular example is multicolored with three different liquid components.