

# MULTI-DOSE PRESERVATIVE-FREE OCULAR LUBRICANTS: IMPROVING THE PATIENT EXPERIENCE



BY MARGUERITE MCDONALD, MD, FACS, AND JERRY D'AVERSA, OD

**D**ry eye disease (DED) is a condition characterized by a loss in homeostasis of the tear film, and it can be accompanied by symptoms of ocular dryness, irritation, burning/stinging, and/or grittiness.<sup>1</sup> Its prevalence ranges widely, depending on the study population and method of assessment, but it has been reported to be as much as 22% in the United States.<sup>2</sup> DED is a multifactorial disease that is managed depending on clinical signs and the stage of severity, but the mainstay therapy is ocular lubricants to provide palliative care.<sup>3</sup>

In the United States, over-the-counter (OTC) artificial tears are marketed under the Food and Drug Administration (FDA) Ophthalmic Final Monograph, which specifies permitted active ingredients, combinations of active ingredients, and their concentrations.<sup>4</sup> However, the monograph does not specify which excipients, or inactive ingredients, can be added to the products, and as a result, overall formulations can vary widely and can be a key differentiator between artificial tear brands.<sup>4</sup> Common inactive ingredients include buffers, viscosity-enhancing agents, phospholipids, osmotic agents, and preservatives.<sup>3</sup>

## PRESERVED VERSUS PRESERVATIVE-FREE FORMULAS

One of the primary considerations for eye care professionals when recommending an ocular lubricant is whether to suggest preserved or preservative-free formulations. The most common preservative in topical drops is benzalkonium chloride (BAK), a quaternary ammonium compound that has hydrosoluble and surfactant or detergent properties that can cause cell death by interacting with lipid components in the cell membrane.<sup>5</sup> Long-term use of BAK-containing drops can induce symptoms of discomfort upon instillation, and burning and stinging sensations, as well as clinical signs of superficial punctate keratitis (SPK), conjunctival hyperemia, staining and follicles, increase in inflammatory cells in conjunctival epithelium, and reduction in goblet cells.<sup>5</sup> Although BAK can be absorbed by human ocular cells and have detrimental effects, it is often used in pharmaceutical drops to enhance drug penetration into the cornea.<sup>5</sup>

Ocular lubricants are available with alternative preservatives, such as polyquaternium-1 (POLYQUAD, PQ-1). PQ-1 is a hydrophilic cationic polymer used in contact lens care solutions, ocular lubricants, and glaucoma medications.<sup>5</sup> Although PQ-1 is known to disrupt microbial cell



Figure 1. SYSTANE HYDRATION MDPF.

membranes, its molecular size is approximately 27 times larger than that of BAK and is thought to be too large to enter mammalian cells, including human ocular cells, thereby minimizing unwanted toxic effects of the ocular surface cells compared to BAK.<sup>5</sup> The 30-year history of PQ-1 has demonstrated improved clinical performance and reduced adverse responses compared to BAK.<sup>5</sup>

Despite the availability of alternative preservatives, preservative-free ocular lubricants can be a desirable option, especially for patients who require frequent daily dosing and/or

who use preserved ophthalmic drops concurrently, such as glaucoma and surgical patients.<sup>5,6</sup> Nasser et al recently reported that switching habitual BAK users to hyaluronate-containing preservative-free drops (Hyabak) resulted in significant reduction of symptoms and SPK after 3 weeks.<sup>7</sup> Switching glaucoma patients from preserved to preservative-free intraocular pressure-lowering drops also demonstrated improvements in symptoms and quality of life.<sup>5</sup>

### PRESERVATIVE-FREE UNIT-DOSE VERSUS MULTI-DOSE DELIVERY SYSTEMS

Preservative-free ocular lubricants in the United States are mostly available in single-use, unit-dose vials, offering continued symptom relief with the key active and inactive ingredients but without the preservatives. Although these vials contain more than what most patients may use in a day, they are for single-use only and should be discarded after use to avoid microbial contamination.<sup>8</sup> Nevertheless, some patients recap the vials to save for multiple uses throughout the day to maximize usage and minimize waste.<sup>9</sup> However, despite the benefit of the preservative-free formulation, the ergonomics of the unit-dose vial can be challenging for elderly patients. In a study of glaucoma patients, those aged 80 years or older had a harder time successfully extracting a drop from the unit-dose vial compared to multi-dose bottles, and they were more likely to scratch the ocular surface or eyelids with the eye drop tip or accidentally spill drops on the eyelids or cheeks compared to their 50- to 60-year-old counterparts.<sup>10</sup>

### SYSTANE HYDRATION MULTI-DOSE PRESERVATIVE-FREE (MDPF)

SYSTANE HYDRATION (Alcon) offers the most advanced non-lipid-based SYSTANE formulation, now available as preservative-free in a multi-dose bottle (Figure 1). SYSTANE HYDRATION has the unique combination of two demul-

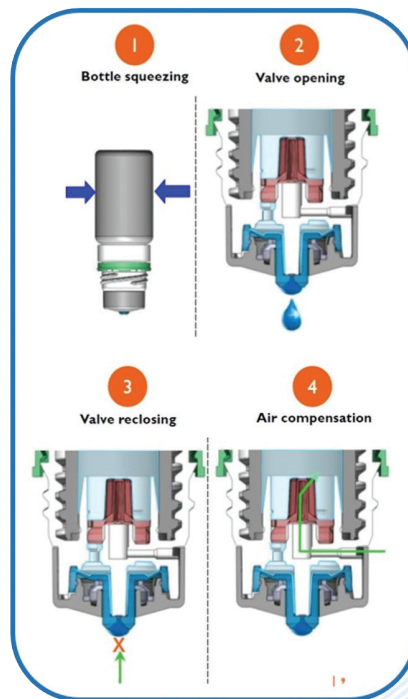


Figure 2. Multi-dose bottle design.

cents (propylene glycol and polyethylene glycol), and the SYSTANE HydroBoost Technology with hydroxypropyl guar (HPGuar) and sodium hyaluronate. HPGuar is a high molecular weight water-loving polymer with chemistry along the polymer backbone to generate a high viscosity gel when placed in the eye, and it binds preferentially to hydrophobic regions via the hydroxypropyl groups to damaged areas of the glyocalyx surface.<sup>11</sup> Sodium hyaluronate is the water-soluble salt form of hyaluronic acid, a biocompatible polysaccharide with unique hygroscopic and viscoelastic properties.<sup>12</sup> Its role as a natural lubricant and its water-retaining properties make it well-suited for the ocular surface to help provide enhanced hydration and comfort to dry eye patients.<sup>13</sup>

The preservative-free formulation is now available in a multi-dose bottle designed to minimize microbial contamination. A one-way valve closes immediately after dispensing a drop to prevent backflow of fluid, and air compensation uses the patented PureFlow Technology to permit air to enter the bottle through a side valve

(Figure 2). A blue outflow tip allows better aim when targeting the eye.

In summary, SYSTANE HYDRATION MDPF offers a preservative-free ocular lubricant with dual-demulcent, dual-polymer (HPGuar and hyaluronate) formulation to provide moisture for long-lasting hydration and lubrication in a convenient, easy-to-use multi-dose bottle. ■

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#### MARGUERITE MCDONALD, MD, FACS

- Clinical Professor of Ophthalmology, NYU Langone Medical Center, New York
- Clinical Professor of Ophthalmology, Tulane University Health Sciences Center, New Orleans
- Private practice, Ophthalmic Consultants of Long Island, Westbury, New York
- Member, CRST Editorial Advisory Board
- [margueritemcdmd@aol.com](mailto:margueritemcdmd@aol.com)
- Financial disclosures: Consultant (Oculus USA)

#### JERRY D'AVERSA, OD

- Optometrist, OCLI Vision, New York and Long Island, New York
- [jerry.daversaad@ocli.net](mailto:jerry.daversaad@ocli.net)
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