

Benzalkonium chloride & Combinations

Indications

- Pharmaceutical products such as eye, ear and nasal drops or sprays, as a preservative
- Personal care products such as hand sanitizers, wet wipes, shampoos, deodorants and cosmetics
- Skin antiseptics, such as Bactine and Dettol
- Some disinfectant solutions, such as post-piercing ear disinfectants.
- Throat lozenges^[4] and mouthwashes, as a biocide
- Spermicidal creams
- Over-the-counter single-application treatments for herpes, cold-sores, and fever blisters, such as RELEEV and Viroxyn
- Burn and ulcer treatment
- Spray disinfectants for hard surface sanitization
- Cleaners for floor and hard surfaces as a disinfectant, such as Lysol
- Algaecides for clearing of algae, moss, lichens from paths, roof tiles, swimming pools, masonry, etc.

Benzalkonium chloride is also used in many non-consumer processes and products, including as an active ingredient in surgical disinfection. A comprehensive list of uses includes industrial applications.^[5] An advantage of benzalkonium chloride, not shared by ethanol-based antiseptics or hydrogen peroxide antiseptic, is that it does not cause a burning sensation when applied to broken skin.^[citation needed],

Medicine^[edit]

Benzalkonium chloride is a frequently used preservative in eye drops; typical concentrations range from 0.004% to 0.01%. Stronger concentrations can be caustic^[6] and cause irreversible damage to the corneal endothelium.^[7]

Avoiding the use of benzalkonium chloride solutions while contact lenses are in place is discussed in the literature.^{[8][9]}

Adverse effects^[edit]

Although historically benzalkonium chloride has been ubiquitous as a preservative in ophthalmic preparations, its ocular toxicity and irritant properties,^[10] in conjunction with consumer demand, have led pharmaceutical companies to increase production of preservative-free preparations, or to replace benzalkonium chloride with preservatives which are less harmful.

Many mass-marketed inhaler and nasal spray formulations contain benzalkonium chloride as a preservative, despite substantial evidence that it can adversely affect ciliary motion, mucociliary transport, nasal mucosal histology, human neutrophil function, and leukocyte response to local inflammation.^[11]

Although some studies have found no correlation between use of benzalkonium chloride in concentrations at or below 0.1% in nasal sprays and drug-induced rhinitis,^[12] others have recommended that benzalkonium chloride in nasal sprays is avoided.^{[13][14]}

In the United States, nasal steroid preparations that are free of benzalkonium chloride include budesonide, triamcinolone acetonide, dexamethasone, and Beconase and Vancenase aerosol inhalers.^[11]

Benzalkonium chloride is irritant to middle ear tissues at typically used concentrations. Inner ear toxicity has been demonstrated.^[15]

Occupational exposure to benzalkonium chloride has been linked to the development of asthma.^[16]

In 2011, a large clinical trial designed to evaluate the efficacy of hand sanitizers based on different active ingredients in preventing virus transmission amongst schoolchildren was re-designed to exclude sanitizers based on benzalkonium chloride due to safety concerns.^[17]

Benzalkonium chloride has been in common use as a pharmaceutical preservative and antimicrobial since the 1940s. While early studies confirmed the corrosive and irritant properties of benzalkonium chloride, investigations into the adverse effects of, and disease states linked to, benzalkonium chloride have only surfaced during the past 30 years.

Benzalkonium chloride is classed as a Category III antiseptic active ingredient by the United States Food and Drug Administration. Ingredients are categorised as Category III when "available data are insufficient to classify as safe and effective, and further testing is required". Benzalkonium chloride is excluded from the current United States Food and Drug Administration review of the safety and effectiveness of consumer antiseptics and topical antimicrobial over-the-counter drug products, meaning it will remain a Category III ingredient.^[18] There is acknowledgement that more data are required on its safety, efficacy and effectiveness, especially with relation to:

- Human pharmacokinetic studies, including information on its metabolites
- Studies on animal absorption, distribution, metabolism, and excretion
- Data to help define the effect of formulation on dermal absorption
- Carcinogenicity
- Studies on developmental and reproductive toxicology
- Potential hormonal effects
- Assessment of the potential for development of bacterial resistance