

TABLE 1.**COMMON PHARMACEUTICAL PRESERVATIVES.**

| PRESERVATIVE | FORMULATION | CONCENTRATION (%) | OPTIMAL pH | SPECTRUM |
|-----------------------|---------------------------|--|------------------------------|---|
| 4-Chlorocresol | Oral, Topical | Up to 0.2 | <9.0 | <ul style="list-style-type: none"> Bacteria, spores, molds, and yeasts Active in acidic media |
| 4-Chloroxylenol | Topical | 0.1 to 0.8 | — | <ul style="list-style-type: none"> Gram (+) bacteria Less active vs Gram (-) bacteria Synergistic with EDTA |
| Benzalkonium | Oral, Ophthalmic, Topical | 0.01 to 0.02 | 4 to 10 | <ul style="list-style-type: none"> Gram (+) > Gram (-) bacteria Ineffective vs resistant <i>P. aeruginosa</i> strains Minimal activity vs bacterial endospores, acid-fast bacteria |
| Benzethonium chloride | Topical, Ophthalmic | Up to 0.5 | 4 to 10 | <ul style="list-style-type: none"> Bacteria, fungi, and molds Synergistic with ethanol Reduced efficacy by soaps and other anionic surfactants |
| Benzoic acid | Oral, Parenteral, Topical | 0.1 to 0.2 | 2.5 to 4.5 | <ul style="list-style-type: none"> Moderate activity vs Gram (+) < Gram (-) Moderate activity vs fungal Moderate activity vs mold |
| Benzyl Alcohol | Parenteral, Topical | 0.2 | 2.5 to 4.5 | <ul style="list-style-type: none"> Bacteria, fungi, molds, and yeasts Moderate activity vs Gram (+) < Gram (-) |
| Cetrimide | Ophthalmic, Topical | <ul style="list-style-type: none"> Ophthalmic: 0.005 Topical: 0.1 to 1.0 | Neutral or slightly alkaline | <ul style="list-style-type: none"> Gram (+) > Gram (-) bacteria Synergistic with alcohols Variable activity vs fungi Synergistic with EDTA vs resistant strains of <i>P. aeruginosa</i>, <i>A. niger</i>, <i>C. albicans</i> |
| Chlorhexidine | Ophthalmic | 0.01 | 5 to 7 | <ul style="list-style-type: none"> Gram (+) > Gram (-) Weak activity vs <i>Proteus</i> and <i>Pseudomonas</i> Inactive vs acid-fast bacilli Weak activity vs molds, yeasts |
| Chlorobutanol | Parenteral | Up to 0.5 | <5.5 | <ul style="list-style-type: none"> Activity Gram (+), Gram (-), and some fungi |
| Imidurea | Topical, Ophthalmic | 0.03 to 0.5 | 3 to 9 | <ul style="list-style-type: none"> Broad-spectrum antibacteria Some antifungal properties Synergistic with parabens vs fungi |
| m-Cresol | Parenteral | 0.15 to 0.3 | <9.0 | <ul style="list-style-type: none"> Moderately Gram (+) > Gram (-) Weak activity vs yeasts and molds |
| Methylparaben | Oral, Parenteral | 0.0018 | 4 to 8 | <ul style="list-style-type: none"> Broad spectrum antimicrobial activity Most effective vs yeasts and molds |
| Phenols 0.5% | Parenteral | 0.01 | <9 | <ul style="list-style-type: none"> Moderate activity vs Gram (+) < Gram (-) Weak activity vs yeasts and molds |
| Phenoxyethanol | Parenteral, Topical | 0.5 to 2.2 | <7 | <ul style="list-style-type: none"> Antibacterial vs <i>P. aeruginosa</i> < <i>Proteus vulgaris</i> Weak activity vs Gram (-) Frequently used in combination with other preservatives |
| Potassium sorbate | Oral, Topical | 0.1 to 0.2 | <6 | <ul style="list-style-type: none"> Predominantly antifungal Moderate antibacterial |

TABLE 1.**COMMON PHARMACEUTICAL PRESERVATIVES CONTINUED.**

| PRESERVATIVE | FORMULATION | CONCENTRATION (%) | OPTIMAL pH | SPECTRUM |
|-----------------|------------------------|--------------------------------------|------------|---|
| Propionic acid | Oral, Topical | ————— | 3.9 | • Bacteria, fungi, and molds |
| Propylparaben | Oral, Parenteral | 0.0002 | 4 to 8 | • Activity vs yeasts and molds > bacteria • Gram (+) > Gram (-) bacteria |
| Sodium benzoate | Oral, Parenteral | Oral: 0.02 to 0.5 Parenteral: 0.5 | 2 to 5 | • Bacteriostatic • Antifungal |
| Sorbic acid | Oral, Topical | 0.05 to 0.2 | 4.5 | • Primarily antifungal • Weak antimicrobial • Synergy with glycol |
| Thimerosal | Ophthalmic, Parenteral | 0.001 to 0.01 | 7 to 8 | • Bactericidal at acidic pH • Bacteriostatic and fungistatic at alkaline or neutral pH • Ineffective vs spore-forming organisms |

Source: United States Pharmacopeial Convention, Inc. *United States Pharmacopeia–National Formulary*. Rockville, MD: United States Pharmacopeial Convention, Inc.; Current Edition.

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