

## Electrical Sterilization of Eye Drops

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**Purpose:** To test the use of Irreversible Electroporation (IRE) for nonchemical sterilization of topical eye medications.

**Methods:** Commercially available Hylo-Comod® preservative-free eyedrop solution was contaminated with 106 CFU/mL Escherichia coli bacteria. Electroporation parameters for sterilization were investigated by comparing electrical fields of 5.4, 7.2, and 10 kV/cm, delivered as 100- $\mu$ s square pulses at 1 Hz in sequences of 10 pulses, 20 pulses, or 20 pulses delivered as four sets of five pulses with 1-min intervals between each set. Pour plate counting method was used to determine microorganism survival. Effects of the treatment on temperature and pH were recorded.

**Results:** Twenty pulses delivered as four separate sets resulted in three orders of magnitude reduction in bacterial load (to 0.14% $\pm$ 0.03%). The solution remained at pH 7.5 and the temperature rose to 35.6 $^{\circ}$  $\pm$ 0.2C when these IRE parameters were used.

**Conclusions:** IRE seems to be a simple method for sterilization of drugs in solution to regulatory requirements, making the use of toxic preservatives such as benzalkonium chloride and thimerosal unnecessary.