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Sterility of Ethyl Chloride Spray After Use in the Clinic

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Abstract

Background: Ethyl chloride spray is used frequently in the outpatient setting as a local anesthetic for injections and aspirations with varying consensus about the sterility of the spray. We hypothesize that ethyl chloride spray remains sterile and would show no bacterial growth during routine clinical use. **Methods:** Thirteen ethyl chloride bottles were collected for testing. Two unopened bottles were used as controls. Eleven unopened bottles were placed in orthopedic clinics and recollected after varying duration of use. The final volume and duration of use were recorded. Each bottle was sprayed in a separate test tube and allowed to evaporate. Trypticase soy broth was added to each tube and incubated for 48 hours. Control test tubes with broth alone were prepared and incubated under the same conditions. Cultures were evaluated at 24 and 48 hours. **Results:** The mean duration of ethyl chloride bottle use prior to culturing was 26 days. The average volume used per day was 1.9 mL. Each ethyl chloride bottle had an initial volume of 103.5 mL. Using the average daily volume usage, an extrapolated lifespan of each bottle was estimated at 7.7 weeks. None of the samples showed bacterial or fungal growth at 24 or 48 hours. **Conclusion:** Ethyl chloride bottles used in the clinical settings showed no bacterial or fungal contamination through their shelf life and routine use. The duration and amount of use did not affect sterility. Although the antimicrobial activity of ethyl chloride spray on skin is debated, ethyl chloride itself remains sterile through clinical use.

Keywords: pain, diagnosis, ethyl chloride, sterility, orthopedic surgery, culture

Introduction

Ethyl chloride spray is used frequently in the outpatient setting as a local anesthetic for injections, aspiration, and minor procedures.[1-11] Although ethyl chloride is labeled as nonsterile, multiple studies have sought to evaluate the sterility of the spray. Current studies on the sterility of ethyl chloride evaluated the bacteriostatic and bactericidal effects on culture plates and skin; none have evaluated the sterility of the spray itself. Further, these bottles are used for weeks to months in the clinic potentially allowing for contamination not accounted for in current studies. We hypothesized that ethyl chloride spray remains sterile and would show no bacterial growth when cultured after use in the clinical setting.

Methods

Eleven new and unopened 103.5 mL Gebauer's Ethyl Chloride Medium Jetspray Topical Anesthetic glass bottles (Gebauer Company Inc. Cleveland, OH) were placed in an outpatient orthopedic surgery clinic in different patient rooms. At various times throughout the duration of the study, the ethyl chloride bottles were collected at the end of the clinical day and subsequently tested in our institution's laboratory. The time elapsed from opening to testing was recorded. Each ethyl chloride bottle's current volume was estimated before testing. This was approximated using a metric ruler to compare the fluid level versus that of an unopened control bottle. Ethyl chloride was sprayed from each bottle into a separate test tube for 2 seconds, the approximate duration of spraying prior to injections in clinic, and then allowed to evaporate. Next, 3 mL of trypticase soy broth (TSB) was added to the test tube, which was incubated by shaking at 37°C for 48 hours. Test tubes were read at 24 and 48 hours to assess for any bacterial growth (cloudiness of the TSB) or

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fungal growth (floating films). Two additional bottles served as controls. Test tubes with 3 mL of TSB alone were also incubated under the same conditions to serve as a further control. At the completion of laboratory testing, the ethyl chloride bottles were returned to the same patient rooms in the clinic. Over the course of the study, seven bottles were sampled one time, three bottles were sampled at two separate times, and one bottle was sampled three separate times.

Results

Eleven ethyl chloride bottles used in the clinical setting were sampled a total of 16 times. Mean duration of use prior to culturing was 26 days (range: 6-54). The average volume of ethyl chloride used per day was estimated to be 1.9 mL (range: 0.5-4.9). Each ethyl chloride bottle had an initial volume of 103.5 mL. Using the average daily volume usage, an extrapolated lifespan of each bottle was estimated at 7.7 weeks. Zero of the 16 total samples displayed any sign of bacterial or fungal growth at 24 or 48 hours. Additionally, neither of the two control samples displayed any bacterial or fungal growth.

Discussion

Ethyl chloride is frequently used across specialties due to its anesthetic effects for injections, aspirations, and even minor procedures.[6,7] In emergency medicine and pediatrics, ethyl chloride has been shown to decrease pain of intravenous catheter insertion.[8,9] In dermatology and plastic surgery, the literature has demonstrated reduced pain with injections and minor procedures.[8-10] Further ethyl chloride has demonstrated improved patient experience with electromyography testing and musculoskeletal injections.[11] Despite the local anesthetic properties, the sterility of ethyl chloride has been debated.

James and Drez[4] used ethyl chloride spray on culture plates inoculated with different bacteria and found no growth inhibition. They concluded the spray did not have bacteriostatic or bactericidal effects. In contrast, Burney et al[5] found a reduction in bacterial count after the application of ethyl chloride to culture plates containing different bacteria. Due to the ability to reduce infection coupled with its anesthetic properties they believed ethyl chloride is effective for injections and arthrocentesis. Both of these studies evaluated the ability to inhibit bacterial growth on culture mediums only and not in a clinical setting.

In addition to testing ethyl chloride on bacterial growth on culture plates, multiple studies have evaluated the disinfectant properties of ethyl chloride on skin simulating injections similar to how they would be performed in the clinic. Azar et al[1] found ethyl chloride to be an effective disinfectant alone and when combined with iodine it may further improve disinfection. Polishchuk et al[3] reported similar results on skin swabs demonstrating no change in the sterility of the injection site after use of ethyl chloride.

Although these studies have demonstrated the disinfectant properties of ethyl chloride, none of these studies evaluated the sterility of the spray or the container. Further, these studies have failed to take into account that these bottles often sit in clinics for weeks and are used countless times.

Limitations of this study include that bacterial and fungal growth was monitored for only for a total of 48 hours. While it is possible that there could have been further growth, it is standard protocol to monitor these cultures for 48 hours. We used a sample of convenience, which is a limitation of our study, although our sample size was comparable to the studies currently in the literature. Finally, we used a metric ruler to measure the fluid level in each bottle to provide an approximate volume usage. This measurement was performed by the same person and in the same manner across all bottles to limit variation and provide consistent values.

We sought to evaluate the sterility of ethyl chloride and the effect of use in the clinic environment. We found ethyl chloride bottles used in the clinical settings showed no bacterial or fungal contamination through their shelf life and routine use. Even with multiple uses and weeks in a clinic there was no change to the sterility of the bottles. The duration of use and amount of use of ethyl chloride spray did not affect sterility. Although the antimicrobial activity of ethyl chloride spray on skin is debated, ethyl chloride itself remains sterile through normal use.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

Procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

Statement of Informed Consent

This study does not disclose any identifiable information and did not involve patients so informed consent was not required.

Declaration of Conflicting Interests

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