A92 Chemical Agents for Use in Preserving Fire Debris Evidence Against Microbial Degradation

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After attending this presentation, attendees will understand the concept of microbial degradation and what chemicals can stop this process and help preserve fire debris evidence.

This presentation will impact the forensic community and the justice system by suggesting means for stopping microbial degradation, which will allow forensic chemists to determine that an ignitable liquid is present and what type of ignitable liquid it is.

The analysis of ignitable liquids, like gasoline, is an important part of the investigation into arson cases. Even after a fire, there can be ignitable liquids still present on materials, including on the surrounding soil. Samples collected at the crime scene usually sit for some time until they can be analyzed. Over time, microorganisms in the soil have been thought to degrade the ignitable liquids to the point where they can no longer be identified. This is problematic for forensic scientists as evidence often times will be allowed to sit for days or weeks before it is analyzed.

Suggested methods for preserving evidence include freezing at -5°C, autoclaving, and using acidic slurry with sodium bisulfate. However, these methods are not practical in a forensic science laboratory. Cold storage would require too much space, autoclaving samples containing ignitable liquids could result in the loss of that ignitable liquid, and creating an acidic slurry would require a large amount of sodium bisulfate. Furthermore, microbial degradation has already begun by the time the samples reach the laboratory, so a method for inhibiting microbial degradation should be applied in the field. The suggested methods are not applicable on site, which also makes these methods unfavorable for use in stopping microbial degradation. However, other chemical agents that are readily available to fire investigators could provide a solution to the microbial degradation.

Bleach, Lysol®, and 3% hydrogen peroxide have been tested in minimal media with soils gathered in winter and summer. An assay using 0.2, 0.4, 0.6, 0.8, and 1mL (3% H_2O_2 only) of each chemical in 10 mL of minimal media inoculated with 10µL of bacteria from the soil. These experiments were also repeated but instead of adding the chemical at the same time as the bacteria, the cultures were allowed to grow for 72hr before the chemical agent was added. 2% bleach was enough to prevent growth in both the cultures from summer and winter soil, whereas 4% was required in order to kill the microbes in both cultures from summer and winter soil. For Lysol, growth was prevented in winter soil cultures with 8% Lysol® for 72hrs. However, after a week growth was present in all cultures. For 3% hydrogen peroxide, 0.06% was enough to prevent growth, but even the 0.3% was not enough to kill the microbes.

Headspace GC/MS was also used to analyze cultures with gasoline and gasoline, bacteria, and the chemical agent in minimal media to determine if the chemical agent was successful in preventing microbial degradation of the gasoline. Other household chemicals will also be tested. **Chemical Agent, Fire Debris, Ignitable Liquid**

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