



U.S. Army Research, Development and Engineering Command



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Development of Alternate Test Method to Measure
Permethrin Content
Luisa C. DeMorais



Purpose:

To identify and validate an alternative solvent to determine the permethrin content in textile substrates materials. Find a suitable solvent to replace acetonitrile. The replacement solvent should be relatively safe to use, readily available and reasonably priced.

Background:

There is currently a universal shortage of acetonitrile, the solvent used by the Government to extract the permethrin insect repellent from a textile substrate. Acetonitrile solvent is a by-product of acrylonitrile production, which is used in a lot of industrial resins and plastics. These are used in making car parts, electronic housings, and many other things that as a result of the global economic slowdown have decreased manufacturing. Consequently, due to its shortage, the price has also more than doubled creating a huge financial burden on all using this product.



Desirable Solvent properties:

- The replacement solvent should be relatively safe to use, readily available and reasonably priced.
- Methanol is a likely alternate candidate due to its extraction efficiency and compatibility with the GC column already in use.
- Methanol elutes well before the permethrin. Its retention time is shorter than permethrin so methanol will not interfere with the permethrin chromatograph.



Project Status:

- Confirmed that methanol when used on the Accelerator Solvent Extractor (A.S.E.) will provide a greater than 95% extraction efficiency
- Small scale testing was completed comparing control samples extracted with methanol against control samples extracted with 80:20 acetonitrile:methanol and the data shows good correlation.



Path Forward:

- Conduct larger scale side by side testing comparing both solvents utilizing control samples as well as production samples.
- Once sufficient data is collected that demonstrates statistically sound correlation an alternate test method will be written for inclusion into the appropriate specifications.
- Ultimately, work with American Association of Textile Chemists and Colorists (AATCC) for inclusion as a Standard Commercial Test Method.