

# Evaluation of Drycleaning Shops Using SolvonK4 (Part II)

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# Health Hazard Evaluations (HHEs)

- ❑ 2 shops using SolvonK4 (butylal) in different states
- ❑ Performed one visit per shop
  - Collected bulk solvent samples for analysis
  - Conducted personal and area air sampling for solvents (including possible byproducts from process)
  - Placed skin patches under protective gloves to assess breakthrough



# Sampling Methods

## □ Air sampling

- Butylal and 1-butanol
  - Charcoal tube with custom analysis method
- Formaldehyde
  - OSHA Method 52
  - NIOSH Method 2016 gave false positives

## □ Skin patch sampling

- Butylal
  - Charcoal cloth (PermeaTec) with custom analysis method



# Control Banding (CB)

We used CB methods to evaluate the following drycleaning tasks:

- ❑ **Task 1: Loading/Unloading/Hanging fabrics from the drycleaning machine**
- ❑ **Task 2: Spraying/Brushing fabrics with a spotting solution containing SolvonK4**

We used the following risk phrase for butylal  
R38-Irritating to skin  
[European Chemical Agency database]

# Shop Characteristics

- ❑ 1 or 2 owners and 3 to 10 employees per shop
- ❑ One dry and one wet cleaning machine per shop
- ❑ 20 to 40 loads run per week
- ❑ Six pressing stations
- ❑ Relied on natural ventilation but one shop had an HVAC system
- ❑ Owner languages: Korean or Cantonese
- ❑ Employee languages: Cantonese or Spanish



# Pre-treatment with degreaser



# Pre-treatment with SolvonK4 based custom mixture



**Wet washing machine**





# Drycleaning machine



# Pressing machine



# Ironing pressing machine



# Air Sampling Results

- ❑ **Full-shift personal airborne exposures**
  - Butylal 0.0017 ppm to 0.83 parts per million (ppm)
  - Formaldehyde very low or not detected (< 0.008 ppm)
  - 1-butanol very low or not detected (< 0.001 ppm)

# Air Sampling Results

- ❑ **Highest full-shift airborne exposures**
  - Closest to the drycleaning machine
  
- ❑ **Highest task-based exposures**
  - Closest to the drycleaning machine
  - Pressing fabrics

# Skin Patch Sampling Results

- ❑ **SolvonK4 still bottom cleaning**
  - Employee reused leather gloves (not appropriate)
  - Low levels of butylal on all four patch samples

## Ventilation and Comfort Measure Results

- ❑ Both shops relied on natural ventilation and on an extraction fan
- ❑ One shop had a functioning ventilation system that was turned on when the drycleaning machine was turned off
- ❑ Comfort conditions suggested potential for heat stress

# Control Banding Results

- **Task 1: Loading/unloading/hanging fabrics from the drycleaning machine**
  - Inhalation COSSH Essential tools
    - Control strategy 1 (general ventilation)
  
  - Inhalation Stoffenmanager tool
    - Low risk score



## Control Banding Results, cont.

- ❑ **Task 2: Spraying/brushing fabrics with a spotting solution containing solvonk4**
  - Inhalation COSSH Essential tools
    - Control strategy 1 (general ventilation)
  - Inhalation Stoffenmanager tool
    - Low risk score

# Control Banding Results, cont.

- **Task 2: Spraying/brushing fabrics with a spotting solution containing solvonk4**
  - **Dermal RISKOFDERM tool**
    - Moderate local effect
      - Hands were considered to have a “necessity of skin care requiring primarily exposure reduction to the chemical”
    - No systemic effect
  - **Dermal Stoffenmanager tool**
    - Medium risk local effect
    - Low risk level systemic effect

# Recommendations

- ❑ **Brush pre-treatment instead of spraying**
- ❑ **Wear appropriate personal protective equipment**
  - Polyvinyl chloride or polyethylene gloves with butylal
  - Safety glasses
  - No use of surgical masks
- ❑ **Wash hands**
- ❑ **Improve or add mechanical ventilation to reduce the SolvonK4 odor and improve thermal comfort**

# Conclusions

- ❑ **SolvonK4 is not a chlorinated solvent and is believed to be safer than PERC, but:**
  - **There are gaps in SolvonK4 toxicity data**
  - **No human health information**
  - **No occupational exposure limit**
  - **Appropriate personal protective equipment is needed when handling the solvent and removing still bottoms to minimize skin contact**
  - **Workpractices such as brushing rather than spraying should be done to minimize unnecessary airborne and skin exposures (and a safety hazard)**

## Current and Future Efforts

- ❑ NIOSH Science Blog open for comments

<http://blogs.cdc.gov/niosh-science-blog/2015/02/24/drycleaning-solvents/>

- ❑ NIOSH website for complete reports

<http://www2a.cdc.gov/hhe/search.asp>

Search for “drycleaning”

- ❑ Interest in evaluating other new solvents





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This website shares information about the Health Hazard Evaluation (HHE) Program and allows you to request an evaluation. You can also search thousands of HHE reports or contact us if you have a question.

Watch our newest video NIOSH Health Hazard Evaluations: Sampling for Exposures. We just released a short video showing how employees help in our evaluations by wearing pumps to measure noise and sample the air for contaminants in their workplace. <http://www.youtube.com/watch?v=kQHbePKW0lg>

2013 Health Hazard Evaluation Program Annual Report  
If you would like a paper copy please send an email to [HHERequestHelp@cdc.gov](mailto:HHERequestHelp@cdc.gov) with your name and mailing address. [http://www.cdc.gov/niosh/hhe/pdfs/HHE\\_2013\\_Annual\\_Report.pdf](http://www.cdc.gov/niosh/hhe/pdfs/HHE_2013_Annual_Report.pdf)

NIOSH Health Hazard Evaluation Program Noise Measurement Database  
We have released a database to provide researchers and other interested stakeholders with noise measurement results collected during HHE surveys from 1996-2012. To view the database go to <http://www.cdc.gov/niosh/data/datasets/RD-1005-2014-0/>.

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