



PaintHealthy CollisionRepair is a collaborative research project to reduce harmful chemical exposures in automotive spray painters.

The purpose of the study is to recommend gloves and coveralls that protect spray painters from the isocyanates and solvents commonly found in automotive paints.

- Glove and coverall materials were tested in laboratory experiments to find out which materials resist isocyanates and solvents.
- Spray painters tested the gloves and coveralls shown in the lab to have the greatest chemical resistance. They tested them under normal working conditions by wearing them while they paint.
- While inhalation is the main route of chemical exposure for painters, skin exposure to isocyanates may also lead to respiratory sensitization and contribute to painter's risk for developing asthma.

Laboratory Testing of Gloves and Coveralls

The goal of the laboratory testing was to identify materials that best resist permeation of isocyanates and solvents.

- Glove & coverall material swatches were mounted inside a permeation cell.
- Directly below the swatch was a filter to capture chemicals that may break through the swatch.
- Several permeation cells were mounted in a panel and sprayed with automotive clearcoat paint in the same manner that a vehicle would be sprayed.
- After spraying, the test swatches were disposed while the filters were tested for isocyanates and solvents at an analytical laboratory.



The Trades Division at Green River Community College near Seattle, Washington was host to the laboratory experiments that tested glove and coverall material (see Laboratory Slideshow below). These experiments were unusual because they tested materials against a mixture of reacting chemicals, such as paint formulations. Typically gloves are tested against single chemicals.

Laboratory Slideshow

More about laboratory testing...

The paint formulations used in these experiments contain isocyanates commonly found in automotive paints:

- hexamethalene diisocyanate (HDI), and
- isophorone diisocyanate (IPDI).

Examples of common solvents found in the formulations include:

- methyl ethyl ketone (MEK)
- methyl isobutyl ketone (MIBK)
- xylene
- toluene
- n-butyl acetate
- ethyl benzene
- 1-methoxy-2-propyl acetate
- 2-heptanone

The types of glove materials being tested include:

- thin latex (5 ml)
- thin nitrile (4 - 5 ml)
- latex/nitrile composites
- tripolymer
- medium nitrile (6 ml)
- thick nitrile (8 ml)
- thick latex (14 ml)
- butyl rubber

Coveralls are typically composed of more than one type of material and the materials being tested include:

- nylon/cotton/polyester
- nylon/cotton
- polyester/carbon fiber
- polypropylene/polyethylene
- Tyvek®

The laboratory experiments began in 2010 and were completed in Spring 2011

Painter Testing of Gloves and Coveralls

THANK YOU to all Washington spray painters and shops for participating in the *PaintHealthy* CollisionRepair study. Painter testing of gloves was completed in November 2011. We greatly appreciated your willingness to test disposable gloves on behalf of your industry. Study results are currently being analyzed and will be posted soon. Unfortunately, we were not able to test painter coveralls as initially planned. More laboratory testing of coveralls is needed before they can be tested by working painters.

The following describes how spray painters tested the gloves.

Painters wore 8 millimeter (ml) thick gloves made of nitrile, the glove type that was identified through laboratory experiments to be the most protective. The gloves were worn while spray painting and evaluated to see whether they provide protection against isocyanates and solvents.

- Volunteer painters were paid \$60 per day to participate for a total of 4 work days.
- The first two workdays established 'baseline' exposure and painters wear what they normally wear as they paint.
- On the last two workdays, painters spray paint while wearing the chemically resistant gloves identified in the laboratory experiments.
- Exposure to isocyanates and solvents was measured each workday in the air, on painter's skin, in urine, breath and blood.
- Exposures will be compared between the baseline workdays and the test workdays to determine whether the gloves truly reduce exposure.

Painter Slideshow

More about painter testing...

- Chemicals in the air were measured with air sampling pumps worn by spray painters while they worked.
- Chemicals on the skin were sampled using medical tape, which lifts chemicals from the skin similar to peeling off a band-aid.
- Isocyanates taken in by the body were measured using the biomarker HDA (1,6-hexamethylene diamine). HDA is made by the body in response to exposure to the isocyanate HDI and can be found in painter's urine and blood.



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

