

Abstract

Glove movement can affect chemical permeation of organic compounds through polymer glove products. However, conflicting reports make it difficult to compare the effects of movement on chemical permeation through commonly available glove types. The aim of this study was to evaluate the effect of movement on chemical permeation of an organic solvent through disposable latex, nitrile, and vinyl gloves. Simulated whole-glove permeation testing was conducted using ethyl alcohol and a previously designed permeation test system. With exposure to movement, a significant decrease ($p \leq 0.001$) in breakthrough time (BT) was observed for the latex (-23%) and nitrile gloves (-31%). With exposure to movement, only the nitrile glove exhibited a significant increase ($p \leq 0.001$) in steady-state permeation rate (+47%) and cumulative permeation at 30 min (+111%). Even though the nitrile glove provided optimum chemical resistance against ethyl alcohol, it was most affected by movement. With exposure to movement, the latex glove was an equivalent option for overall worker protection, because it was less affected by movement and the permeation rate was lower than that of the nitrile glove. In contrast, the vinyl glove was the least affected by movement, but did not provide adequate chemical resistance to ethyl alcohol in comparison with the nitrile and latex gloves. Glove selection should take movement and polymer type into account. Some glove polymer types are less affected by movement, most notably the latex glove in this test. With nitrile gloves, at least a factor of three should be used when attempting to assign a protection factor when repetitive hand motions are anticipated. Ultimately, the latex gloves outperformed nitrile and vinyl in these tests, which evaluated the effect of movement on chemical permeation. Future research should aim to resolve some of the observed discrepancies in test results with latex and vinyl gloves.