

Abstract

Background:

The selection of disposable nitrile exam gloves is complicated by (i) the availability of several types or formulations, (ii) product variability, and (iii) an inability of common quality control tests to detect small holes in the fingers. Differences in polymer formulation (e.g. filler and plasticizer/oil content) and tensile properties are expected to account for much of the observed variability in performance.

Objectives:

This study evaluated the tensile properties and integrity (leak failure rates) of two glove choices assumed to contain different amounts of plasticizers/oils. The primary aims were to determine if the tensile properties and integrity differed and if associations existed among these factors. Additional physical and chemical properties were evaluated.

Methods:

Six clean room and five low-modulus products were evaluated using the American Society for Testing and Materials Method D412 and a modified water-leak test to detect holes capable of passing a virus or chemical agent.

Results:

Significant differences in the leak failure rates and tensile properties existed between the two glove types ($P \leq 0.05$). The clean room gloves were about three times more likely to have leak failures (chi-square; $P = 0.001$). No correlation was observed between leak failures and tensile properties. Solvent extract, an indication of added plasticizer/oil, was not associated with leak failures. However, gloves with a maximum modulus <4 MPa or area density (AD) <11 g cm⁻² were about four times less likely to leak.

Conclusions:

On average, the low-modulus gloves were a better choice for protection against aqueous chemical or biological penetration. The observed variability between glove products indicated that glove selection cannot rely solely on glove type or manufacturer labeling. Measures of modulus and AD may aid in the selection process, in contrast with common measures of tensile strength and elongation at break.