



Sustainable Hospitals Program

A Project of the Lowell Center for Sustainable Production, University of Massachusetts Lowell

Vinyl Medical Gloves: What are the concerns?

Question: I'm working at a hospital that is searching for an alternative to latex gloves. Vendors are pointing us in the direction of polyvinyl chloride gloves. Is this really an improvement? Any suggestions?

Answer: Vinyl, also referred to as polyvinyl chloride or PVC, is one of the materials commonly used to make examination gloves. Concerns about vinyl exam gloves can reflect 3 areas of the glove's "life": **manufacturing**, **use**, and **disposal**.

- Concerns about **manufacturing** vinyl products include 1) that PVC is produced from vinyl chloride monomer, a very toxic substance that is a known human carcinogen and 2) that dioxin, another likely human carcinogen and a persistent bioaccumulative toxic substance (PBT), can be emitted as an unintended byproduct of PVC production. (You can learn more about the vinyl chloride monomer at the Agency for Toxic Substances and Disease Registry: <http://www.atsdr.cdc.gov/tfacts20.html> and about Dioxin at <http://www.cfsan.fda.gov/~lrd/dioxinqa.html>).
- During the **use** of vinyl gloves, two aspects to consider are:
 - A number of studies suggest that **PVC medical gloves are not as robust a barrier** to bloodborne pathogens as other gloves^{1, 2, 3}. (References are included on the next page). Since the primary reason for wearing medical gloves is for barrier protection, one must carefully consider the barrier performance in selecting gloves.
 - Although there is little evidence of a specific health hazard to the wearer of vinyl gloves, the literature suggests that **in rare instances there may be allergic contact dermatitis reactions** to certain additives in the PVC plastic⁴.
- When gloves are **disposed**, many end up in waste incinerators. At this stage a concern is that under certain typical incinerator conditions, incineration of PVC can result in the formation of dioxins (the same family of chemicals described above). It is possible to imagine that if vinyl gloves were landfilled, plasticizers could leach out under some conditions, although the Sustainable Hospitals Program (SHP) staff has never seen any studies documenting this.

The SHP has two online fact sheets on Selecting Medical Gloves that outline steps for making an informed choice of gloves. Basically, a facility should define **who** the glove is protecting, **what** is being protected against (e.g. blood & body fluids, chemicals, chemotherapy drugs, et cetera), and **how long** the glove is worn. Once this baseline is defined, the hospital can work with manufacturers or vendors to obtain gloves that have been tested and demonstrated as effective barriers for the specific hazards. You can see the SHP fact sheets on glove selection at the following links.

- *Glove Selection fact sheet:*
http://www.sustainablehospitals.org/HTMLSrc/IP_Latex_GloveFacts.html
- *Gloves for Chemotherapy fact sheet:*
<http://www.sustainablehospitals.org/PDF/ChemotherapyGloves.pdf>

More information is available on the SHP Website:
<http://www.sustainablehospitals.org>

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PVC Gloves, 11/01/05

References to articles:

¹Denise Korniewicz, El-Masri M, Broyles JM, Martin, CD and O'Connell K; "**Performance of latex and nonlatex medical examination gloves during simulated use**", AJIC (American Journal of Infection Control), Volume 30(2), April 2002, pp 133-138

From the Abstract: "The purpose of our study was to determine the effects of glove stress, type of material (vinyl, nitrile, copolymer, latex), and manufacturer on the barrier effectiveness of medical examination gloves".

Results: Our limited sample size demonstrated that nitrile gloves had the lowest failure rate (1.3%), followed by latex (2.2%); vinyl and copolymer gloves had the highest failure rate (both 8.2%). With use of a logistic regression analysis adjusting for manufacturer and stress, latex examination gloves were found to be 3 times more likely to fail than nitrile gloves (odds ratio 3.2; 95% CI, 1.37-7.50). Nitrile gloves were also found to fail significantly less often than vinyl or copolymer gloves (odds ratio, 12.60, CI, 5.8-27.40)"

Conclusions: Nitrile examination gloves are a suitable alternative to latex, whereas vinyl and copolymer examination gloves were found to be less effective barriers".

²Albert Rego and Lorraine Roley, "**In-use barrier integrity of gloves: Latex and nitrile superior to vinyl**", AJIC, October 1999, Volume 27, No. 5, pp 405-410

Conclusions: This study indicates that the latex and nitrile gloves evaluated were comparable in terms of barrier performance characteristics both used and during manipulations mimicking patient care procedures.

Whereas stretch vinyl exhibited lower failure rates than standard vinyl, the higher in-use leakage rates associated with all vinyl gloves tested indicate decreased durability and, potentially, compromised barrier protection when this synthetic is used".

³Carlene Muto, Sstrom M; Strain B, Farr B; **Glove Leakage Rates as a Function of Latex Content and Brand: Caveat Emptor**; Arch Sur, Vol 135, Aug 2000; pp 982-985

Conclusions: Food and Drug Administration approval should not be interpreted as suggesting equality of different manufacturers' products. Some low latex and non-latex content gloves are very resistant to leakage and should provide an effective barrier for preventing exposure to blood-borne pathogens, while others may not." This article includes tables of leakage of gloves right out of the box and after manipulation.

⁴Lucretia Matthieu, Godoi AF, Lambert J, Van Grieken R; **Occupational allergic contact dermatitis from bisphenol A in vinyl gloves**; Contact Dermatitis, Dec 2003; pp. 281-283

Discussion: Additives responsible for allergic reactions to vinyl gloves are an organic pigment Irgalite Orange F2G, epoxy resin of bisphenol A, the plasticizers tricresyl and triphenyl phosphate and di(2-ethylhexyl)phthalate." (Note: In making this statement, the authors referenced Kanerva et al, 1995; Fregert et al, 1963; Estlander et al, 1996; and Sugiura et al, 2000).

For more information on medical gloves, visit the Sustainable Hospitals Website at www.sustainablehospitals.org or contact the Sustainable Hospitals Program by email (shp@uml.edu) or phone (978-934-3386).