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CLINICAL SUMMARY

EVALUATION OF THE PERMEATION OF ANTINEOPLASTIC AGENTS THROUGH MEDICAL GLOVES OF VARYING MATERIALS AND THICKNESS AND WITH VARYING SURFACE TREATMENTS

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BACKGROUND

Medical gloves are an important piece of personal protective equipment (PPE) that prevents the healthcare worker from exposure to antineoplastic agents which are potentially cytotoxic, mutagenic, teratogenic, and carcinogenic. The permeability of medical gloves to antineoplastic agents is a crucial factor in the appropriate selection of gloves.

OBJECTIVES AND METHODS

Among the various PPE, medical gloves encounter the highest risk of exposure to antineoplastic agents during the handling process. This study was conducted to help understand the relationship between glove permeability by material type, thickness, and surface treatment. The five antineoplastic agents tested were etoposide, cyclophosphamide, doxorubicin hydrochloride, paclitaxel, and fluorouracil. The permeability test for this study used medical gloves made of non-powdered chlorinated latex, powdered non-chlorinated latex, and powder-free nitrile to assess the effect of the permeation. The thickness of the gloves and effectiveness of double gloving was also evaluated according to ASTM D6978 *Standard practice for assessment of resistance of medical gloves to permeation of chemotherapy drugs* protocol.

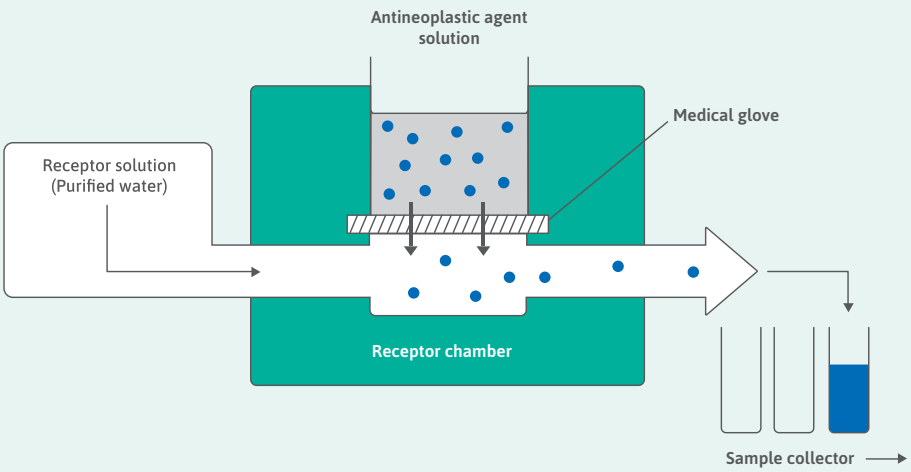

Figure 1: The schematic diagram of the flow in-line cell system

RESULTS

The permeability of the three distinct types of gloves against Etoposide 20 mg/ml (ETP), Cyclophosphamide monohydrate 20 mg/ml (CPA), Doxorubicin hydrochloride 10 mg/ml (DXR), Paclitaxel 6 mg/ml (PTX) and Fluorouracil 50 mg/ml (5FU) showed no statistical differences in breakthrough time results. However, this study's clinical relevance lies in demonstrating that nitrile gloves showed excellent permeation resistance >240 min to all drugs whereas both latex gloves showed lower resistance to CPA and 5FU.

The powdered non-chlorinated latex gloves showed the worst results against CPA and 5FU, with an increased time-dependent permeation over the powder-free chlorinated latex gloves.

The authors also studied the permeability of chlorinated powder-free latex gloves' thickness variability to antineoplastic agents. Powder-free chlorinated latex gloves showed better resistance when thickness increases or when double-gloved, compared to single gloves, with the equivalent total thickness. The authors did not study the thickness variability in nitrile and powdered non-chlorinated gloves, however.

As the author suggests, another interesting finding from this study shows evidence that larger molecular weight reduces the diffusion rate constants with the glove material and results in a lower permeability rate. The molecular size and lipophilic properties of antineoplastic agents may play a role in permeability rates, and need more exploration.

CONCLUSION

The result indicate that the permeation of antineoplastic agents is dependent on the glove material and the surface treatment. There is evidence that antineoplastic drugs lipophilic and molecular weight play a role in permeability constants rate through a glove material.

Nitrile gloves remains the glove material of choice and out-performs powdered or powder free latex gloves evaluated in this study. In addition, the permeability of the gloves to antineoplastic agents decreases with an increase in glove thickness, and double gloving showed to be effective when compared to single gloves with equivalent total thickness.

The authors' conclusions support the use of double gloving and nitrile gloves in handling antineoplastics agents.

APPLICATION FOR PRACTICE

1. Double gloving is recommended when handling antineoplastics
2. Examination nitrile gloves offers a preferred choice in glove selection over latex
3. Follow recommended policy and procedures of your establishments considering engineering and environmental controls

Powdered Medical gloves are increasingly restricted by regulations and guideline recommendations. Germany, the United Kingdom (UK), and the United States (US) banned the use of powdered medical gloves, with many other countries soon replicating the US FDA ban.

Note: This clinical summary is written by clinicians at Ansell Healthcare Products LLC. Please refer to the actual study for full text information.

Oriyama T., Yamamoto T., Yanagihara Y., et al., Evaluation of the permeation of antineoplastic agents through medical gloves of varying materials and thickness and with varying surface treatments Journal of Pharmaceutical Health Care and Sciences 2017; 3:13.

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