

Annals of Occupational Hygiene

- [Oxford Journals](#)
- [Medicine](#)
- [The Annals of Occupational Hygiene](#)
- [Volume 53, Number 3](#)
- Pp. 289-296

◀ [Previous Article](#) | [Next Article](#) ▶



Annals of Occupational Hygiene Advance Access originally published online on March 11, 2009
Annals of Occupational Hygiene 2009 53(3):289-296; doi:10.1093/annhyg/mep009

© The Author 2009. Published by Oxford University Press on behalf of
the British Occupational Hygiene Society

Permeation of Hair Dye Ingredients, *p*-Phenylenediamine and Aminophenol Isomers, through Protective Gloves

Hsiao-Shu Lee and Yu-Wen Lin *

Department of Public Health, Fu-Jen Catholic University, College of
Medicine, No. 510, Zhongheng Road, Sinjhuang City, Taipei County
24205, Taiwan

* Author to whom correspondence should be addressed.
Tel: +886-2-29052068; fax: +886-2-29056382; e-mail:
056416@mail.fju.edu.tw

Skin irritation and contact allergies are skin disorders common to hairdressers. The predominant oxidative hair dye components, such as *p*-phenylenediamine (PPD) and aminophenol isomers, can cause contact dermatitis. Use of protective gloves can prevent dermal contact with skin irritants. This study investigates the permeation behaviors of *p*-aminophenol (PAP), *m*-aminophenol (MAP), *o*-aminophenol (OAP) and PPD in single and mixed challenge solutions with disposable natural rubber latex (NRL) gloves, disposable polyvinylchloride (PVC) gloves

This Article

- ▶ [Full Text](#) **FREE**
- ▶ [FREE Full Text \(PDF\)](#) **FREE**
- ▶ All Versions of this Article:
53/3/289 **most recent**
[mep009v1](#)
- ▶ [Alert me when this article is cited](#)
- ▶ [Alert me if a correction is posted](#)

Services

- ▶ [Email this article to a friend](#)
- ▶ [Similar articles in this journal](#)
- ▶ [Similar articles in PubMed](#)
- ▶ [Alert me to new issues of the journal](#)
- ▶ [Add to My Personal Archive](#)
- ▶ [Download to citation manager](#)
- ▶ Search for citing articles in:
[ISI Web of Science \(3\)](#)
- ▶ [Request Permissions](#)

Citing Articles

- ▶ [Scopus Links](#)
- ▶ [Citing Articles via CrossRef](#)

Google Scholar

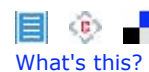
- ▶ [Articles by Lee, H.-S.](#)
- ▶ [Articles by Lin, Y.-W.](#)
- ▶ [Search for Related Content](#)

PubMed

- ▶ [PubMed Citation](#)
- ▶ [Articles by Lee, H.-S.](#)
- ▶ [Articles by Lin, Y.-W.](#)

Social Bookmarking

and neoprene (NP) gloves. The challenge solutions were 4% PPD (w/v), 3% OAP (w/v), 2% PAP (w/v) and 2% MAP (w/v) in ethanol or 12% hydrogen peroxide



solutions. The cocktail solutions of the four chemicals were also tested. An American Society for Testing and Materials type permeation cell, ethanol liquid collection and gas chromatography–flame ionization detection of samples taken from the collection medium every 10 min facilitated determination of breakthrough times (BTs), cumulative permeated masses and steady-state permeation rates (SSPRs). Experiments were 4 h long for the NRL and PVC gloves and 8 h for NP gloves. No chemicals tested broke through the NP gloves when exposed for 8 h. In the ethanol solution, PPD and OAP started breaking through the PVC gloves at 40 min. The SSPRs of PVC gloves were higher than those for NRL gloves in all challenge conditions for both single chemicals and mixtures. No tested chemicals in hydrogen peroxide solutions permeated the gloves during the 4-h tests. The chemical composition of the challenge solution was a main effector of BTs and SSPRs for the NRL glove. For disposable PVC gloves, the main factors of BTs were molecular size [molar volume (MV)] and polarity ($\log K_{ow}$), and the primary factors of SSPRs were concentration, MV and $\log K_{ow}$. In conclusion, disposable NRL gloves and disposable PVC gloves should not be used repeatedly for handling the hair dye products. Hydrogen peroxide did not accelerate chemical breakthrough. The compositions of the challenge solutions and physical and chemical properties (MV and $\log K_{ow}$) affected permeation behaviors for different gloves.

Keywords: aminophenols • chemical-protective gloves • hair dyes • permeation • *p*-phenylenediamine

Received July 30, 2008; in final form February 10, 2009

CiteULike Connotea Del.icio.us [What's this?](#)

This article has been cited by other articles:



The Annals of Occupational Hygiene

[HOME](#)

T. Ogden

Managing Dermal Risk: Moving On From Gloves

Ann. Hyg., March 1, 2010; 54(2): 131 - 133.

[\[Full Text\]](#) [\[PDF\]](#)



The Annals of Occupational Hygiene

▶ HOME

C. L. Packham

Permeation of Hair Dye Ingredients through Gloves

Ann. Hyg., October 1, 2009; 53(7): 771 - 771.

[\[Full Text\]](#) [\[PDF\]](#)



Occupational MEDICINE

▶ HOME

P. Noone

Temporary employment, leukaemia and hair dyes

Occup. Med., September 1, 2009; 59(6): 441 - 441.

[\[Full Text\]](#) [\[PDF\]](#)



Disclaimer: Please note that abstracts for content published before 1996 were created through digital scanning and may therefore not exactly replicate the text of the original print issues. All efforts have been made to ensure accuracy, but the Publisher will not be held responsible for any remaining inaccuracies. If you require any further clarification, please contact our [Customer Services Department](#).

Online ISSN 1475-3162 - Print ISSN 0003-4878

[Copyright © 2010 British Occupational Hygiene Society](#)

Oxford Journals *Oxford University Press*

- [Site Map](#)
- [Privacy Policy](#)
- [Frequently Asked Questions](#)

Other Oxford University Press sites:

