



10 GOOD REASONS TO USE POWDER FREE GLOVES

Exposure to powder from both surgical and examination gloves can cause a number of undesirable reactions that are today well documented:



1. POWDER CAN CAUSE THE DEVELOPMENT OF ADHESIONS AND GRANULOMAS.

Well documented concerning the peritoneal cavity, but also reported in almost every anatomical site such as the eyes, oral region, cranial cavity, middle ear, thorax, bladder.

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16



2. POWDER INCREASES THE RISK FACTOR FOR POST-OPERATIVE WOUND INFECTIONS.

As with most foreign bodies, glove powder decreases the inoculum of bacteria required to produce abscesses (in this case being reduced by a factor of at least 10 fold.¹⁵ Moreover, powder delays wound healing and alters the normal reparative process while at the same time increases the wounds inflammatory response.^{16,17,8}



3. POWDERED GLOVES CAN INCREASE LATEX ALLERGENS SENSITIZATION AND PROVOKE HYPERSENSITIVITY TYPE I REACTIONS.

Powdered gloves can demonstrate a much higher level of Natural Rubber Latex (NRL) allergens than powder free gloves and might increase latex sensitization or induce immediate reaction of hypersensitivity type I through direct contact.

18,19,20,21,22,23,24,25,26,27,28,29,30



4. POWDER CONTAMINATES THE HOSPITAL ENVIRONMENT AND INCREASE EXPOSURE TO LATEX ALLERGENS THROUGH AIR INHALATION.

NRL protein allergens can bind to glove powder. These allergens/proteins coated powder particles can be released into the air when the gloves are donned or removed. Inhalation or ingestion of these particles can lead to the sensitization and diverse allergic reactions to NRL (i.e. upper respiratory tract symptoms or eye irritation)

31,32,33,34,35,36



5. POWDER CAN INCREASE THE RISK OF CROSS CONTAMINATION OF MICROORGANISMS.

Glove powder can also act as a vehicle for opportunistic and pathogenic micro-organisms, which increase the occupational risks to healthcare workers and risks to patients. Powder particle contamination of catheters, perfused donor kidneys and cosmetic dentistry materials (crowns, prostheses) among others has been widely reported.^{37,38}



6. POWDER CAN INTERFERE IN LABORATORY TESTING CAUSING FALSE RESULTS.

Powder can cause false results i.e. PCR – Polymerase Chain Reaction, enzyme immunoassay or some HIV tests and powder granuloma being misdiagnosed as metastatic carcinoma.^{39,40,41}



7. POWDER HAS AN ABRASIVE ACTION ON THE SKIN.

Powder has a mechanical effect on hand skin by increasing its rugosity as shown by laser profilometry analysis of hand skins replicas.⁴²



8. POWDER UNBALANCES SKIN PH.

The skin pH which is of relevance for the protection against microorganisms (bacteria, fungi) is normally about 5.5. The skin pH remains alkaline for hours after wearing powdered gloves due to alkalinity of powder.^{42,43,44}



9. POWDER INTERACTS WITH ALCOHOL-BASED HAND SOLUTIONS.

After removal of the gloves, alcohol hand rubs may interact with residual powder on the hands of personnel, resulting in a gritty feeling on the hands. Powder tends also to soil hands with organic content which demands to be eliminated with water and plain soap cleaning before re-applying alcohol scrub.^{45,46}



10. POWDER INCREASES TIME AND COSTS.

Glove powder has to be removed after donning a surgical glove (by using sterile water or saline and sterile sponge or towel), which adds cost and time to the procedure. It has been reported as being at least seven times higher than the cost of using powder free gloves while at the same time being inefficient in totally removing the glove powder.^{47,48,49,50,51,52}

REFERENCES

- (1) Lyon F, Taylor RH: Conjunctival granuloma caused by surgical talc. *J AAPOS*. 2007 Aug;11(4):402-3. Epub 2007 Apr 19.
- (2) Dwivedi AJ, Kuwajerwala NK, Silva YJ, Tennenberg SD. Effects of surgical gloves on postoperative peritoneal adhesions and cytokine expression in a rat model. *Am J Surg*. 2004 Nov;188 (5):491-4.
- (3) Van den Tol MP, Haverlag R, van Rossen ME, Bonthuis F, Marquet RL, Jeekel J. Glove powder promotes adhesion formation and facilitates tumour cell adhesion and growth *Br J Surg*. 2001 Sept; 88 (9):1258-63
- (4) Luijendijk RW, cdLange DCD, Wauters CCAP, Hop WCJ, Duron JJ, Pailier JL, Camprodon BR, Holmdahl L, vanGeldorp HJ, Jeekel J. Foreign material in postoperative adhesions. *Annals of Surg*, 223: 242-248, 1996.
- (5) Becker JM, Dayton MT, Fazio VW, et al. Prevention of postoperative abdominal adhesions by a sodium hyaluronate based bioresorbable membrane: a prospective randomized double blind multicenter study. *J Am Coll Surg*, 1996 183: 297-306.
- (6) Hunt TK. Can adhesions be prevented? *J Amer Coll Surgeons*, 183: 406-407, 1996.
- (7) Duron, J.J. et al. Post-operative peritoneal adhesions and foreign bodies. *Eur. J. Surg. Suppl.* 1997; vol. 579: 15-16.
- (8) Cantoni GM, Longo T. [Peritoneal reactions caused by starch used regularly for lubricating surgical gloves. Review of the literature] *Minerva Chir*. 1994 Jun; 49(6):569-74.
- (9) Kamffer WJ, Jooste EV, Nel JT, de Wet JI. Surgical glove powder and intraperitoneal adhesion formation. An appeal for the use of powder-free surgical gloves. *S Afr Med J*. 1992 Feb 1;81(3):158-9.
- (10) Hunt, T.K. et al. Starch powder contamination of surgical wounds. *Arch. Surg*. 1994; vol 129(8): 825-827.
- (11) Eynon CA, Thomson WH: Experimental study of starch-induced intraperitoneal adhesions. *Br J Surg*. 1991 Mar; 78(3):377.
- (12) McEntee GP, Stuart RC, Byrne PJ, Leen E, Hennessy TP. Experimental study of starch-induced intraperitoneal adhesions. *Br J Surg*, 77: 113-114, 1990.
- (13) Eggert A, Teichmann W, Docu N, Kopf R. [Starch granulomas caused by glove powder] *Chirurg*. 1981 Jun; 52(6):380-4. Yaffe H et al. Potentially deleterious effect of cornstarch glove powder in tubal reconstruction surgery. *Fertil Steril* 1978; 29(6):699-701.
- (14) Yaffe H et al. Potentially deleterious effect of cornstarch glove powder in tubal reconstruction surgery. *Fertil Steril* 1978; 29(6):699-701.
- (15) Emerson, M. Chairman's conclusions. *Eur J Surg*. 1997.
- (16) Odum, B.C. et al. Influence of absorbable dusting powders on wound infection. *J. Emerg. Med*. 1998; vol. 16(6): 875-9.
- (17) Filon F., Larese Radman G. **Latex Allergy:** A Follow-up Study of 1040 Healthcare workers. *Occupational and Environmental Medicine* 2006 Feb; 63(2):121-5.
- (18) Bousquet J, Flahault A, Vandenplas O, et al. (2006). Natural rubber latex allergy among health care workers: a systematic review of the evidence. *J Allerg Clin Immunol* 118: 447-454.
- (19) Allmers H, Schmengler J, John SM. 2004 Decreasing incidence of occupational contact urticaria caused by natural rubber latex allergy in German healthcare workers. *J Allergy Clin Immunol* 114:347-351.
- (20) Reunal T., Turjanmaa K., Alenius H., Reinikka-Railo H., Palosuo T. A Significant Decrease in the incidence of Latex-Allergic Healthcare Workers Parallels with a Decreasing Percentage of Highly Allergenic Latex Gloves in the Market in Finland. *J.Allergy Clin. Immunol*. 2004; 113(2): S60, Abstract 140.
- (21) Cullinan P, Brown R, Field A, et al. 2003 Latex allergy. A position paper of the British Society of Allergy and Clinical Immunology. *Clin Exp Allergy* 33: 1484-1499.
- (22) Kelly KJ., Klancnik M., Kurup V, Barrios-Jankol C., Fink J.N. and Petsonk E.L. A Four-Year Prospective Study to Evaluate the Efficacy of Glove Interventions in Preventing Natural Latex Sensitization in Healthcare Workers at Two Hospitals. *J. Allergy Clin. Immunol*. 2003, Part 2; Vol. 111, No. 2, No. 426.
- (23) Charous BL, Blanco C, Tarlo S, Hamilton RG, Bayr X, Beezhold D, Sussman G, Yuninger JW. Natural Rubber Latex Allergy after 12 Years: Recommendations and Perspectives. *J Allergy Clin Immunol*. 2002 Jan;109 (1):31-4.
- (24) Hunt, L. W., Kalker P., Reed, C.E. and Yunginger J. W. "Management of Occupational Allergy to Natural Rubber Latex in a Medical Center: The Importance of Quantitative Latex Allergen Measurement and Objective Follow-Up." *J. Allergy Clin. Immunol*. 2002; 110:S94-106.
- (25) Turjanmaa K., Kanto M., Kautiainen H., Reunala T. and Palosuo T. Long-term Outcome of 160 Adult Patients with Natural Rubber Latex Allergy. *J. Allergy Clin. Immunol*. 2002; 110: S70-74.
- (26) Edelstam G, Arvanis L, Karlsson G. Glove Powder in the Hospital Environment-Consequences for Healthcare Workers. *Intl. Arch Occup Environ Health*. 2002 Apr;75(4):267-7
- (27) Cumming R. Reducing the Hazard of Exposure to Cornstarch Glove Powder. *AORN*. 2002 Aug;76(2):288-95.
- (28) Tarlo S.M., Easty A., Dubanks K., Min F. and Liss G.Outcomes of a Natural Rubber Latex Control Program in an Ontario Teaching Hospital. University Health Network and Department of Medicine and Public Health Sciences, University of Toronto. *J. Allergy Clin. Immunol*. 2001; 108: 628-633.
- (29) Phillips ML, Meagher CC, Johnson DL. What is "Powder-free"? Characterisation of Powder Aerosol Produced during Simulated Use of Powdered and Powder-free Latex Gloves. *Occup Environ Med*.2001 Jul;58(7):479-81.
- (30) Liss GM, Tarlo SM. Natural Rubber Latex-related Occupational Asthma: Association with Interventions and Glove Changes over Time. *Am J Ind Med*. 2001 Oct;40(4):347-53.
- (31) Dyck R. Historical Development of Latex Allergy. *AORN*. 2000 July.
- (32) Allmers H, Brehler R, Chen Z, Raulf-Heimsoth M, Fels H, Bayr X. Reduction of Latex Aeroallergens and Latex specific IgE Antibodies in Sensitised Workers After Removal of Powdered Natural Rubber/Latex Gloves in a Hospital. *J Allerg Clin Immunol*. 1998 Nov;102(5): 841-6
- (33) Hesse A, Peters KP, Koch HU. Type I Allergies to Latex and the Aeroallergenic Problem. *Euro J Surg Supp*. 1997;579:19-22
- (34) Newsom SW, Shaw M. A Survey of Starch Particle Counts in the Hospital Environment in Relation to the Use of Powdered Latex Gloves. *Occup Med (London)*. 1997 Apr;47(3):155-8
- (35) Tomazic JV et al. Cornstarch powder on latex products is an allergen carrier. *J Clin Immunol* 1994; 93(4): 751-8.
- (36) Moriber-Katz, S. et al. Contamination of perfused donor kidneys by starch from surgical gloves. *Am J Clin Pathol*.1998; Jul90 (1): 81-84.
- (37) Min KW et al. Cornstarch embolization in renal transplants. *Kidney Int* 1972; 2: 291-2.
- (38) Lampe AS et al. Wearing gloves as cause of false negative HIV tests. *Lancet* 1998; 2(8620): 1140-41.
- (39) Lomas JG et al. False negative results by polymerase chain reaction due to contamination by glove powder. *Transfusion* 1992; 32: 83-5.
- (40) Sharefkin JB et al. The cytotoxic effect of surgical glove powder particles on adult human vascular endothelial cell cultures: implications for clinical users of tissue culture techniques. *J Surg Res* 1986; 41: 463-72.
- (41) Brehler R, Voss W, Müller S. Glove powder affects skin roughness, one parameter of skin irritation. *Contact Dermatitis*. 1998 Nov;39(5):227-30.
- (42) Mirza R, Maani N, Liu C, Kim J, Rehms W.A randomized, controlled, double-blind study of the effect of wearing coated pH 5.5 latex gloves compared with standard powder-free latex gloves on skin pH, transepidermal water loss and skin irritation. *Contact Dermatitis* 2006 Jul;55(1):20-5.
- (43) Brehler R, Rütter A, Kütting B. Allergenicity of natural rubber latex gloves. *Contact Dermatitis*. 2002 Feb; 46(2):65-71
- (44) Pittet D, Allegranzi B, Boyce J; World Health Organization World Alliance for Patient Safety First Global Patient Safety Challenge Core Group of Experts. The World Health Organization Guidelines on Hand Hygiene in Health Care and their consensus recommendation. *Infect Control Hosp Epidemiol*. 2009 Jul;30(7):611- 22.
- (45) Boyce JM, Pittet D; Healthcare Infection Control Practices Advisory Committee. Society for Healthcare Epidemiology of America. Association for Professionals in Infection Control. Infectious Diseases Society of America. Hand Hygiene Task Force. Guideline for Hand Hygiene in Health-Care Settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/ISA Hand Hygiene Task Force. *Infect Control Hosp Epidemiol*. 2002 Dec;23(12Supl):S3-40.
- (46) Phillips, V.L., et al. Health Care Worker Disability Due to Latex Allergy and Asthma: A Cost Analysis. *American Journal of Public Health* 199989(7), 1024-1028.
- (47) Field, E.A. The use of powdered gloves in dental practice: a cause for concern? *J. Dent*. 1997; vol. 25: 209-214.
48. Edelstam, J. et al. Glove powder in the hospital environment – consequences for healthcare workers. *Int. Arch. Environ Health* 2002; vol. 75: 267-271
- (48) Edelstam, J. et al. Glove powder in the hospital environment – consequences for healthcare workers. *Int. Arch. Environ Health* 2002; vol. 75: 267-271
- (49) Herman B. 11 statistics on average hospital costs per stay. <http://www.beckers-hospitalreview.com/eweekly/HRE121613.htm>. Accessed January 16, 2015.
- (50) A latex-free approach to operating room savings. How to make the switch. <http://ortoday.com/a-latex-free-approach-to-operating-room-savings/>. Accessed November 11, 2015.
- (51) Zimlichman E, Henderson D, Tamir O, et al. Health care-associated infections: ameta-analysis of costs and financial impact on the US health care system. *JAMAIntern Med*. 2013;173(22):2039-2046.
- (52) V. L. Phillips, DPhil, Martha A. Goodrich, MD, MPH, and Timothy J. Sullivan, MD, Health Care Worker Disability Due to Latex Allergy and Asthma: A Cost Analysis. *American Journal of Public Health*. July 1999, Vol. 89, No. 7.