

Why CSTDs should be used when compounding & administering antibiotics

Usage of antibiotics in Sweden is at least 140 fold greater than antineoplastic drugs¹. In a recent study, the use of Tevadaptor® significantly reduced antibiotics contamination in several hospital wards²

Spill and leakage of antibiotics present a significant health risk to Health Care Workers

Preparation and administration of antibiotics are widespread over many departments in hospitals and many health care workers, especially nurses, are involved in handling these drugs daily. Adverse health effects of occupational exposure to antibiotics in health care personnel are occasionally published. Weak and moderate effects include hypersensitivity (itching, runny nose, irritation of the eyes), allergic skin reactions (eczema, urticaria, allergic dermatitis) and respiratory symptoms (asthma and wheezing)³. More severe effects may even include anaphylactic shock.

Long term effect of exposure is not well established but may cause building up resistant strains of bacteria in the working area that will be harmful to patients and health personnel.

Two surveys of 161 and 153 Health Care Workers (HCW) (nurses and pharmacists) in two hospitals in Korea revealed a 17.4% and 20.3% increased IgE sensitization to three common cephalosporins, respectively. This detection system was concluded to be "sensitive to screen for symptomatic or asymptomatic sensitized HCW"^{4,5}. None of the subjects used protective equipment when handling the antibiotics^{4,5}.

A retrospective study⁶ by Pinheiro et al. tested 4 female nurses working at surgical departments who developed allergic contact dermatitis (ACD). Patch tests showed

positive reactions to ampicillin, cefazolin, cefotaxime and ceftriaxone as well as several penicillins. It was concluded that occupational ACD is significant in healthcare workers.

Cases of severe allergic reactions in nurses due to antibiotics exposure are rare. Nevertheless, reports of anaphylactic reactions to cefuroxime⁷ or piperacillin⁸ were published. It was concluded that work-related systemic allergic reactions to antibiotics may occur in nurses after inhalation of low doses and without perceived association with drug-specific tasks like handling of antibiotics⁷.

A study by Nygren et al. screened 21 hospital wards in 16 hospitals, with a total of 206 samples. The screening showed that the use of Closed System Transfer Devices (CSTDs) during antibiotics compounding and administration significantly reduces the risk of spillage and contamination⁹. Swab testing showed an adverse correlation between the use of CSTDs and the level of contamination. Hospital wards and pharmacies that use CSTDs had the lowest spill and leakage, whereas wards that use open injection needle venting were with the highest level of contamination⁹.

Correlation of Antibiotic Contamination Levels in Hospital Wards with Different Drug Transfer Systems

In a study² recently performed in 3 hospitals in Europe, potential contamination of work areas was tested before and after implementation of a CSTD (Tevadaptor®). Potential surface contamination was tested by swab samples. Stationary air samples and personal air samples from the nurses during antibiotics preparation, administration and patient care were also tested. The most frequently used antibiotics were monitored: vancomycin, meropenem, amoxicillin, ceftriaxone, cefotaxime, piperacillin and benzylpenicillin. Extracts of wipe and air samples were analysed using LC-MSMS (detection limit: 1 ng/ml extract). The results showed that using conventional preparation techniques widespread contamination with antibiotics up to 767 ng/cm² was detected. After implementation of the Tevadaptor® CSTD overall contamination levels significantly

decreased for the most frequently prepared antibiotics in all three hospitals. Using the conventional preparation technique three antibiotics were detected in environmental air of seven nurses in two hospitals (0.01 to 5 µg/m³), whereas after implementation of the CSTD only one antibiotic was detectable in environmental air in one hospital (1.4 µg/m³).

This study adds data regarding the high contamination rate during use of conventional preparation techniques for antibiotics, and provides support that CSTDs, specifically Tevadaptor® significantly reduce contamination². Reducing the exposure should be expected to have a positive effect on reducing local or systemic adverse health effects in Health care providers.



1. Apoteket. Försäljningsstatistik (Sale statistics (in Swe)). Apoteket AB, Stockholm. 2010. See URL: <http://www2.apoteket.se/om/VadViGor/Forsalj/default.htm>
2. Sessink, P. et al., 2018, Reduction of Contamination with Antibiotics on Surfaces and in Environmental Air in Three European Hospitals Following Implementation of a Closed-System Drug Transfer Device, *Annals of Work Exposures and Health*, 63(4):459-467
3. Tadokoro K et al. Cefotiam-induced IgE-mediated occupational contact anaphylaxis of nurses; case reports, RAST analysis, and a review of the literature. *Clin Exp Allergy*. 1994 Feb;24(2):127-33
4. Identifying Genetic Susceptibility to Sensitization to Cephalosporins in Health Care Workers. Young-Hee N et al. *J Korean Med Sci*. 2012 Nov; 27(11):1292–1299.
5. IgE Sensitization to Cephalosporins in Health Care Workers. Jeong-Eun K et al. *Allergy Asthma Immunol Res*. 2012 4(2):85-91
6. Pinheiro V. et al., Occupational allergic contact dermatitis caused by antibiotics in healthcare workers – relationship with non-immediate drug eruptions, *Contact Dermatitis*, 2018, 78(4):281-286.
7. van Kampen V. et al., 2018, Occupational generalized urticaria and anaphylaxis after inhalation of cefuroxime in a nurse, *Am J Ind Med* 61:261-266
8. Gaspar-Marques J. et al., 2018, Piperacillin-tazobactam anaphylaxis: a rare cause of occupational disease, *Eur Ann Allergy Clin Immunol*, 50:89-91
9. Nygren O. & Lindhal R. Screening of spill and leakage of antibiotics in hospital wards. *Journal of ASTM International*, 2011, Vol. 8, Issue 6.

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