

Do nebulizers place therapists at risk of occupational exposure?

Asthma risk and occupation as a respiratory therapist

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In the modern hospital environment, many health care workers are exposed to hazardous substances. Among these hazards are respiratory sensitizers, irritants, and infectious agents. A previous cross-sectional study of Rhode Island respiratory therapists reported an excess risk of asthma after entry into that profession. Before the results of that study were published, we conducted a confirmatory mailed questionnaire survey of 2,086 Massachusetts respiratory therapists and 2,030 physical therapists and physical therapy assistants. Neither the survey questionnaire nor the accompanying cover letter revealed the focus of our investigation. A history of physician-diagnosed asthma was reported by 16% of respiratory therapists and 8% of control subjects. When analysis was restricted to those who developed asthma after entry into their profession, respiratory therapists still had a significant excess, 7.4 versus 2.8%. The odds ratio for respiratory therapy was 2.5 (95% CI, 1.6 to 3.3) after adjustment for age, family history, atopic history, smoking, and gender. These results confirm the previous report of excess risk of asthma among respiratory therapists. This excess risk develops after entry into the profession and does not appear to be explained by bias or confounding. Efforts should be directed to identifying potential agents responsible for this form of occupational asthma.

Second Hand (S)-albuterol: RT exposure risk following racemic albuterol

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Racemic albuterol (RAC), a 50:50 mix of (R)-albuterol [R] and (S)-albuterol [S], is commonly used by RTs. R confers all of the bronchodilatory effects, while S demonstrates proinflammatory properties in *in vitro* and *in vivo* models. S is metabolized 10-fold more slowly, resulting in higher plasma levels that remain in circulation much longer after RAC administration. RTs have a higher rate of developing asthma after entering their profession (7.4 vs 2.4%, respectively; Christiani, 1993). Whether exposure to nebulized medications such as RAC contribute to this, or some other occupational hazard is responsible, is unknown. This study was designed to determine if S and R are detectable in the plasma of RTs. Eligible subjects (at least 18 years old; no asthma or other lung disease; at least 4 hrs of RAC exposure on each of 4 study days) began the study after a 2-day work holiday. Blood was drawn for S and R levels at baseline, 2, 4, and 8 hrs after exposure on Days 1 and 4. Subjects (n=12; mean age 38 yrs) nebulized delivered were exposed to approximately 31 mg of RAC by nebulization or MDI (range 22-43 mg) for 4.3 hours (range 3.2-5.5 hours) each day. At baseline on Day 1, On Day 1, mean levels of R and S were below the limit of quantification (BLQ, <2 pg/mL) at baseline, but were detectable after 2 hrs and increased over the 8-hr period. S levels were 1.6-2.5-fold higher than R (Table). On Day 4, approximately 2416 hrs after the last exposure, baseline levels of S, but not R, were detectable (3.7 pg/mL). Peak flow improved or remained unchanged in most subjects, but decreased in 3/12 subjects by an average of 30 mL. R- and S-albuterol are detectable in RTs following administration of RAC. S achieves higher plasma levels that remain in the systemic circulation for a longer period of time.

Identification of airborne dissemination of epidemic multiresistant strains of *Pseudomonas aeruginosa* at a CF centre during a cross infection outbreak

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Background: Chronic *Pseudomonas aeruginosa* infection is a major cause of morbidity and mortality for individuals with cystic fibrosis (CF). *P. aeruginosa* cross infection outbreaks have recently been reported at CF holiday camps and specialist centres. The mechanism of cross infection is unknown. A study was performed to look for the presence of epidemic strains of *P. aeruginosa* in the environment of a CF centre during a cross infection outbreak and to examine their potential modes of spread between patients. Methods: Microbiological sampling of the environment of the CF facility was performed, including room air sampling. Individual *P. aeruginosa* strains were identified by bacterial fingerprinting. The typing patterns were compared with those of epidemic strains responsible for cross infection among the patients. Results: Epidemic *P. aeruginosa* strains were isolated from room air when patients performed spirometric tests, nebulisation, and airway clearance, but were not present in other areas of the inanimate environment of the CF centre. Conclusions: Aerosol dissemination may be the most important factor in patient-to-patient spread of epidemic strains of *P. aeruginosa* during recent cross infection outbreaks at adult CF centres.

A Major Outbreak of Severe Acute Respiratory Syndrome in Hong Kong

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Background: There has been an outbreak of the severe acute respiratory syndrome (SARS) worldwide. We report the clinical, laboratory, and radiologic features of 138 cases of suspected SARS during a hospital outbreak in Hong Kong. Methods: From March 11 to 25, 2003, all patients with suspected SARS after exposure to an index patient or ward were admitted to the isolation wards of the Prince of Wales Hospital. Their demographic, clinical, laboratory, and radiologic characteristics were analyzed. Clinical end points included the need for intensive care and death. Univariate and multivariate analyses were performed. Results: There were 66 male patients and 72 female patients in this cohort, 69 of whom were health care workers. The most common symptoms included fever (in 100 percent of the patients); chills, rigors, or both (73.2 percent); and myalgia (60.9 percent). Cough and headache were also reported in more than 50 percent of the patients. Other common findings were lymphopenia (in 69.6 percent), thrombocytopenia (44.8 percent), and elevated lactate dehydrogenase and creatine kinase levels (71.0 percent and 32.1 percent, respectively). Peripheral air-space consolidation was commonly observed on thoracic computed tomographic scanning. A total of 32 patients (23.2 percent) were admitted to the intensive care unit; 5 patients died, all of whom had coexisting conditions. In a multivariate analysis, the independent predictors of an adverse outcome were advanced age (odds ratio per decade of life, 1.80; 95 percent confidence interval, 1.16 to 2.81; $P=0.009$), a high peak lactate dehydrogenase level (odds ratio per 100 U per liter, 2.09; 95 percent confidence interval, 1.28 to 3.42; $P=0.003$), and an absolute neutrophil count that exceeded the upper limit of the normal range on presentation (odds ratio, 1.60; 95 percent confidence interval, 1.03 to 2.50; $P=0.04$). Conclusions: SARS is a serious respiratory illness that led to significant morbidity and mortality in our cohort.

Quote from the publication:

"We suspected that the infection was transmitted by droplets and possibly by fomites, and we therefore instituted both airborne precautions (e.g., use of the N-95 respirator) and contact precautions (e.g., use of gowns and gloves), as recommended by the CDC. However, the use of a jet nebulizer to administer aerosolized albuterol in the index patient had probably aggravated the spread of the disease by droplet infections."

Chronic exposure to a beta 2-adrenoceptor agonist increases the airway response to methacholine.

Witt-Enderby PA, Yamamura HI, Halonen M, Palmer JD, Bloom JW. Department of Pharmacology, College of Medicine, University of Arizona Health Sciences Center, Tucson 85724. *Eur J Pharmacol* 1993 Sep 7;241(1):121-3.

Scheduled chronic administration of beta 2-adrenoceptor agonist bronchodilators in patients with asthma recently has been reported to be associated with a worsening of symptoms and an increase in bronchial responsiveness. We wanted to determine whether a 28-day in vivo exposure to albuterol (beta 2-adrenoceptor agonist) altered the response of rabbit airways to the cholinergic agonist methacholine. We found, using in vitro tissue bath techniques, that in mainstem bronchi from rabbits given a 28-day exposure to albuterol, maximum contraction to methacholine was increased in the albuterol-treated group (control group = 1.10 +/- 0.11 g vs. treated group = 1.50 +/- 0.13 g, $P < 0.05$). The potency (EC_{75}) was also increased in the albuterol-treated group. The potency for the control group was 5.6 microM (95% confidence limit: 2.3-13 microM) and was 1.7 microM (95% confidence limit: 1.1-2.8 microM, $P < 0.05$) for the albuterol-treated group. In a subgroup of animals, maximum contraction to KCl, a receptor-independent contractile stimulus, was not significantly different between the groups (control group = 0.79 +/- 0.23 g vs. treated group = 0.82 +/- 0.20 g). The potency (EC_{50}) for KCl-induced contractions was also not significantly different between the groups: control = 12 mM (95% confidence limit: 3.3-44 mM) vs. treated 19 mM (95% confidence limit: 18-20 mM). These data demonstrate that chronic in vivo exposure to a beta 2-adrenoceptor agonist can alter the in vitro tissue bath response of airway smooth muscle to methacholine