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## CLINICAL VIGNETTE

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# Acute Lung Disease from Bathtub Refinishing

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### Case Presentation

A 63-year-old female with hypertension, post-traumatic stress disorder, and epilepsy presented to the Emergency Department with difficulty breathing and cough. Six days prior, the patient entered her apartment and was exposed to noxious fumes. She discovered that the fumes were coming through the vent in her bathroom. She walked over to her next-door neighbor's apartment, where a team wearing respirators was refinishing the bathroom with a spray-on resurfacing material and a chemical accelerator. The fumes had traveled through the vent into her adjacent room. After initial exposure to the fumes, she developed difficulty breathing, coughing, and a burning sensation in her throat. She opened the windows in her apartment to air out the fumes, but continued to have progressive worsening of symptoms.

Upon initial interview, the patient was tripodding, speaking only in short sentences, and coughing vigorously. On exam, the patient had a temperature of 96.3F, a pulse of 100, blood pressure of 144/96mmHg, respiratory rate of 35 breaths per minute, and pulse oximetry of >95% on room air. The physical exam of her head, ears, nose and throat was normal. Expiratory wheezes could be heard throughout all lung fields. Cardiac exam was unremarkable. A bedside chest radiograph showed no consolidation or vascular congestion. A venous blood gas demonstrated pH 7.45, pCO<sub>2</sub> 35.9, and calculated bicarbonate of 24.7. Carbon monoxide level was undetectable.

Given her moderate respiratory distress, the patient was treated with albuterol and ipratropium nebulizer treatment in three doses, spaced 20 minutes apart. This provided some respiratory improvement but she continued to have diffuse wheezing. Poison control agreed with the nebulizer treatment. Steroids were also recommended if there was concern for bronchospasm. Given continued shortness of breath and diffuse wheezes, she was given 125 mg of methylprednisolone, which completely alleviated her symptoms. She was discharged on prednisone 40mg for 4 days and an albuterol inhaler, with instruction to follow up with her primary care doctor regarding further management for her likely irritant induced asthma. On follow up the next day, no wheezing was noted and her shortness of breath had resolved but the cough persisted.

### Discussion

Bathtub refinishing is a known occupational health hazard and has been associated with multiple disease processes. There have

been documented fatal exposures to refinishing agents containing methylene chloride during residential bathroom resurfacing.<sup>1</sup> Methylene chloride is a volatile agent that is used to strip paint from bathtubs, and it can be absorbed via inhalation and through the skin.<sup>1</sup> The chemical has toxicities to multiple organs, including the lungs.<sup>2</sup> The lung pathologies of methylene chloride exposure have not been as well characterized, but there is a case report of airway hyperactivity and acute respiratory distress syndrome after methylene chloride exposure.<sup>2</sup> There is also an autopsy report documenting mucous plugging of the bronchi and bronchioles after methylene chloride bathtub refinishing.<sup>1</sup> The primary site of methylene chloride metabolism is the liver and one of its metabolites is carbon monoxide.<sup>3</sup> Although methylene chloride is considered a low toxic form of carbon monoxide poisoning, acute toxic manifestation of carbon monoxide poisoning has been reported through inhalation of methylene chloride.<sup>4</sup>

Another bathtub refinishing agent, toluene isocyanate, has also been associated with multiple lung diseases. An early case report demonstrated immunologic and imaging findings consistent with hypersensitivity pneumonitis related to occupational exposure from bathtub refinishing, which the authors labeled "bathtub refinisher's lung".<sup>5</sup> An extrinsic allergic alveolitis was seen in that report, which resolved after stopping his occupation as a bathtub refinisher.

Another pulmonary disease process has been described in relation to toluene isocyanate exposure — reactive airway dysfunction syndrome (RADS) or irritant induced asthma. A recent case report describes toluene isocyanate exposure and a case of irritant induced asthma.<sup>6</sup> This patient, similar to ours, had no prior history of lung disease, and had asthma-like symptoms that persisted after the initial exposure to bathtub refinishing and resolved with asthma pharmacotherapy.<sup>6</sup> While pulmonary function testing was not obtained on our patient, the history, physical exam, and treatment response were indicative of irritant induced asthma. Therefore, it is important to recognize bathtub refinishing, as well as other activities that involve exposure to solvents and isocyanates, to be not only occupational health hazards but also a cause of lung disease in bystanders.

The use of steroids to treat respiratory distress secondary to the inhalation of noxious fumes is controversial. A case report suggests a benefit to systemic steroids in the treatment of chlorine

gas inhalation.<sup>7</sup> The evidence for steroids, systemic or inhaled, for the treatment of the inhalation of other noxious gases, such as ammonia or sulfur dioxide is even poorer, with no studies showing a benefit, but none showing a downside to steroid therapy.<sup>8,9</sup> A review of acute inhalation injuries published in 2010 concluded that systemic steroids are useful when patients develop RADS, which is the sudden onset of asthma-like symptoms after an inhalation incident.<sup>10</sup> This review is consistent with our case, suggesting steroids are useful after inhalation injuries if patients present with clinical signs and symptoms of bronchial hyper-reactivity, such as dyspnea, cough, and wheezing.

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