

Case Report

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## Sodium polystyrene sulfonate (Kayexalate) aspiration

Luis F Gonzalez-Cuyar, Nathaniel B Cresswell and Allen P Burke\*

Address: Department of Pathology University of Maryland School of Medicine, 22 South Greene Street, NBW64, Baltimore, Maryland, USA

Email: Luis F Gonzalez-Cuyar - [luisgonzocuyar@gmail.com](mailto:luisgonzocuyar@gmail.com); Nathaniel B Cresswell - [nathaniel.cresswell@gmail.com](mailto:nathaniel.cresswell@gmail.com);

Allen P Burke\* - [allen.burke@gmail.com](mailto:allen.burke@gmail.com)

\* Corresponding author

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### Abstract

In this short report we illustrate a case of extensive sodium polystyrene sulfonate (SPS) aspiration as an immediate cause of death in a terminally ill patient. SPS is a cation exchange resin utilized to decrease potassium levels in patients with renal failure. When administered rectally in conjunction with sorbitol, colonic necrosis and perforation have been documented. On the other hand, oral administration can be complicated by aspiration, especially in very ill or debilitated patients. In our current report, histological examination of a patient who aspirated SPS shows multiple polygonal to amorphous basophilic crystalline particles deposited intraalveolarly. The purpose of our report is to familiarize pathologists with the histologic features of this rare iatrogenic complication of therapy for hyperkalemia.

### Findings

We report a case of a 45 year-old male patient with a history of HIV, Hepatitis B, and Hepatitis C secondary to illicit drug use. He also suffered from end-stage renal disease with persistent hyperkalemia which was treated with hemodialysis. The patient was admitted for a total right hip arthroplasty as a treatment for severe osteoarthritis. On post operative day four the patient suffered changes in mental status, fever, and decreased saturations and was treated for a presumptive diagnosis of pneumonia. On post operative day nine potassium levels remained elevated and the patient was administered 15 grams of SPS solution orally. One hour later the patient developed poor saturations, was severely hypoxemic, deteriorated, and expired.

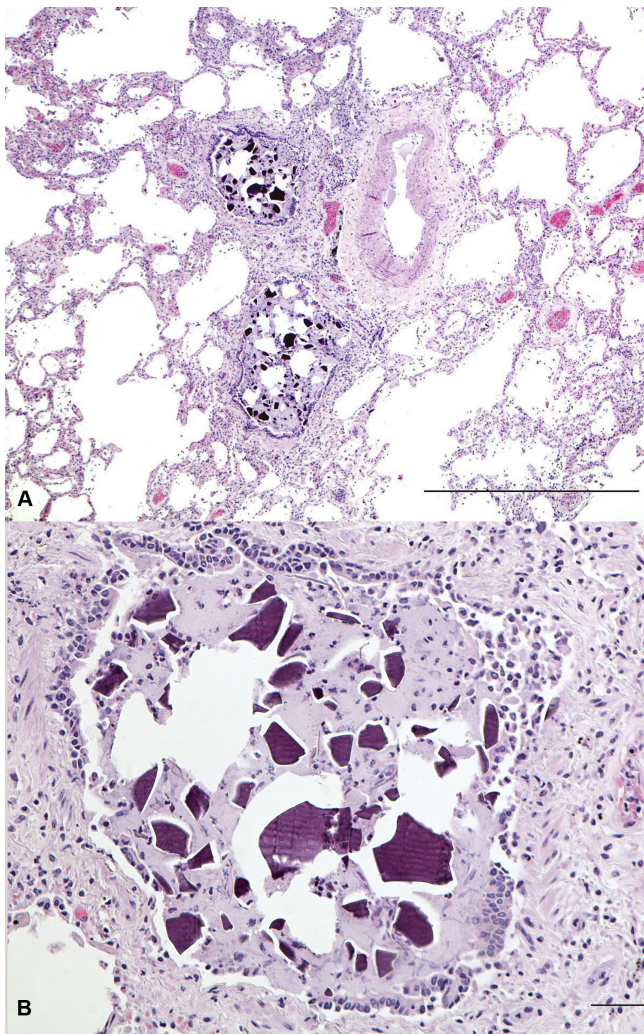
Post mortem gross examination revealed severe pulmonary congestion (right lung 1,260 grams; left lung 1,080 grams) with focal consolidations. There was no evidence of emboli and the airways were free of any gastric con-

tents. Additional pertinent gross findings included a remote left ventricular infarct, cardiomegaly (680 grams), and hepatosplenomegaly (liver 2,240 grams; spleen 430 grams).

Histological examination of all lung lobes revealed extensive intraalveolar deposition of purple polygonal to amorphous crystals ranging in measurement from 1 to 60 micrometers (Figure 1). Additionally, there were geographic foci of bacterial bronchopneumonia and diffuse emphysematous changes. Tissue gram stain was positive for gram-positive cocci in chains.

### Discussion

The administration of sodium polystyrene sulfonate (SPS) is used extensively for the treatment of hyperkalemia, especially in patients with renal failure [1-3]. Other uses have been reported, however [4-7]. SPS is an ion-exchange resin that exchanges Na<sup>+</sup> for K<sup>+</sup> in the gastrointestinal tract, especially in the colon, and increases the



**Figure 1**  
**A – Medium power magnification demonstrating purple polygonal intraalveolar kayexalate crystals on a background of emphysematous changes.** Scale bar 1000  $\mu\text{m}$ . **B – High power magnification showing the SDS crystals in high detail measuring up to 60  $\mu\text{m}$  as well as smaller amorphous ones.** Scale bar 20  $\mu\text{m}$ .

fecal excretion of potassium ions. It can be administered orally or rectally suspended in sorbitol, water, or dextrose. Historically, reports of ischemic colitis and colonic necrosis after rectal administration of SPS in sorbitol solution are abundant in the literature, but rare for the upper gastrointestinal tract [8-18]. Other complications such as thrombocytopenia [19] and rectal stenosis [20] have been reported. Administration of SPS suspended in dextrose or water has been suggested to avoid sorbitol related complications; however, recent reports have shown sorbitol-free SPS enemas to cause similar colonic catastrophes [21].

SPS aspiration is a potential complication of oral administration, especially in debilitated patients [22,23]. One study reports an incidence of intestinal necrosis in 1.8% of post operative patients [13]. The aspiration of SPS was first described by Oi [24] in 1978 in a post term hyperkalemic female infant with meconium aspiration. After a second oral administration the infant became cyanotic, bradycardic, apneic, and expired [24]. The microscopic appearance of the intraalveolar material was then compared to a solution of 25% SPS which yielded similar histological features [24]. In an animal model, Haupt et al [25] demonstrated that the inflammatory reaction following SPS aspiration is not solely attributed to concomitant aspiration of gastric contents.

The purpose of this report is to document a rare, often undiagnosed, and fulminant cause of death among patients with renal failure under the administration of potassium lowering agents. The particular appearance of SPS on histological sections should highlight it as a possible cause of aspiration pneumonia. In our patient, SPS aspiration superimposed on an already compromised pulmonary function was the immediate cause of death. Both methods of administration of the cation exchange resin have been proven effective, but rectal administration may prove beneficial in avoiding aspiration pneumonitis in chronically ill and debilitated patients.

### Competing interests

The authors declare that they have no competing interests.

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