Danger in the Vapor? ECMO for adolescents with status asthmaticus after vaping

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Background

- Electronic nicotine delivery systems (ENDS) use in adolescents and young adults is on the rise
- Many young ENDS users prefer sweet flavorings
- The effect of sweet flavorings on airway epithelium is not well studied
- There is concern of possible adverse effects of sweet ENDS flavorings on airway epithelium, particularly in those with asthma.
- We review two adolescent patients with recent and past ENDS use and asthma who required veno-venous extracorporeal membranous oxygenation (VV-ECMO) for status asthmaticus.

https://phil.cdc.gov/Details.aspx?pid=23262

Case Summaries

	Case 1	Case 2
Patient description	16 yo Male	14 yo Female
Patient history	Severe persistent asthma, allergic rhinitis, obesity	Severe persistent asthma
Presenting symptoms	Respiratory distress, 3 days of malaise	Respiratory distress, 2 weeks of shortness of breath and cough
Presenting ABG	pH 6.85, pCO2 >100 mm Hg	pH 6.97, pCO2 105 mm Hg
Vaping history	Personal and secondary exposure	Personal exposure
Home medications	Fluticasone-salmeterol 500-50 mcg 2 puffs BID, montelukast 10 mg qd, cetirizine 10 mg qd	None
Clinical course	Difficult intubation with possible aspiration, hypercarbic respiratory failure, initiated on VV-ECMO	Non-invasive ventilation, intubated, hypercarbic respiratory failure, initiated on VV-ECMO
Medical interventions	Continuous albuterol, intermittent ipratropium, methylprednisolone	Continuous albuterol, IV magnesium, methylprednisolone, IV terbutaline, IV aminophylline, inhaled helium
Chest radiography	Hypoinflation, pneumomediastinum	Pneumomediastinum, left lower lobe opacity likely atelectasis
Discharge interventions	Cessation counseling, continue asthma medications.	Cessation counseling, budesonide-formoterol 160-4.5 mcg 2 puffs BID

Concerns about Flavorings

- There has been a dramatic increase in flavorings from 466 in 2012 to over 15,000 flavors in 2016.
- Sweet and creamy flavors are the most popular among adolescents and young adults
- Flavorings use known airway irritants including benzaldehyde, cinnamaldehyde, and diacetyl.
- Diacetyl alters respiratory epithelial cell gene expression and is linked in lung injury and has been linked with bronchiolitis obliterans in popcorn factory workers

Red circle: corrosive effect of cinnamedlehyde electronic cigarette solution on plastic after 2 hours. Photo from Dr. Jasper's lab.

Discussion

- ECMO for pediatric status asthmaticus is rare, but has been more common in recent years
- These cases certainly had confounding factors of lack of asthma control and medication noncompliance
- Both had significant vaping histories, begging the question if it was a factor in the severity of their presentation
- More research is needed to determine the adverse effects of vaping on lung injury in children

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