

# CONNECTICUT SCIENCE & ENGINEERING FAIR

[www.ctsciencefair.org](http://www.ctsciencefair.org)

## Top Winners in the 2018 Connecticut Science & Engineering Fair

( Student information as of April 2018 )

**Kavin Kathir, Grade 8**

**St. Bridget School, Cheshire, CT**

*Transforming Trash Into Treasure: A Sustainable Approach To Oil Spill Cleanup*

### Connecticut Science & Engineering Fair Awards

- \* Pfizer Life Sciences Awards --- 3rd Place- Life Sciences 8th grade- \$100 & trophy and Invite to Compete Broadcom MASTERS
- \* Environmental Sciences Awards with CACIWC --- MS Finalist - CACIWC gifts, CSF Medallion
- \* Future Sustainability Awards - Eversource /energizeCT --- 2nd Place Middle School - \$200 Cash and Trophy
- \* Alexion Biotechnology Awards --- Finalist - Biotechnology 8th grade - CSF Medallion
- \* Office of Naval Research- U.S. Navy / U.S. Marine Corps --- Middle School- Certificate, \$25 gift card given by CSEF
- \* Ricoh Americas Corporation --- Certificate, \$25 Amazon gift card given by CSEF
- \* National Oceanic and Atmospheric Administration --- Certificate and medallion, ,and \$25 Amazon gift card given by CSEF
- \* Southeastern New England Marine Educators --- \$100 award and membership in SENEME - 1st Place Junior & T-Shirt
- \* Air and Waste Management Association, Connecticut Chapter --- \$100 Junior, Environmental Research, waste recycling related
- \* TurnKey Compliance Solutions Environmental Awards --- \$200 Cash Award Middle School- For excellence in environmental sciences

### Abstract

Oil spill cleanup is a colossal and pressing problem in our world today. About 1.5 million gallons of oil are spilled each year and millions of dollars are spent to cleanup the spilled oil. These spills also harm marine animals and pollute drinking water. Due to these detrimental environmental effects, cleaning up oil spill is imperative. Finding an effective method to combat these oil spills will greatly reduce the amount of damage and the cost of oil spill cleanup. The aim of this project was to test natural sorbents' oil retention under different conditions. The plant based biodegradable sorbents such as salvinia minima and milkweed were tested. The hypothesis was that milkweed fibers would be more effective for oil spill cleanup due to its hydrophobic, oleophilic nature and its tubular structure than salvinia minima. The sorbents' retentions were tested and compared in fresh water and salt water. In addition, milkweed was tested for recovery and reusability by recovering the adsorbed oil using a vacuum filter unit. Results from this study indicate that milkweed was a more effective sorbent than salvinia minima and could be reused multiple times. Milkweed is a biomass that has 'super power' of cleaning up oil spill up to 40 times of its weight. Hopefully, the results from this study will help to find an eco-friendly and cost effective solution for oil spill cleanup using natural, biodegradable sorbents that can preserve the world.

### Biography

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( Student information as of April 2018 )

**Hannah Goldenberg, Grade 9**

**Greenwich High School, Greenwich, CT**

*From Tobacco to a Chemical Cocktail: A Smoker's E-cigarette Alternative May Lead to Bronchiolitis Obliterans*

### Connecticut Science & Engineering Fair Awards

- \* Pfizer Life Sciences Awards --- 4th Place- Life Sciences Senior High- Plaque
- \* American Society of Safety Engineers, CT Valley Chapter --- \$150 grade 9-12 project
- \* TurnKey Compliance Solutions Environmental Awards --- \$300 Cash Award High School- For excellence in environmental sciences

### Abstract

E-cigarette use has become a widespread problem. Advertised as a smoking cessation aide, many believe that these devices pose different, far-reaching dangers, relative to tobacco cigarettes. While little is known about their contents, many have conjectured that their pod flavors contain diacetyl, a ketone that causes irreversible narrowing of the bronchioles (bronchiolitis obliterans). This research provides first-in-literature synopsis of the contents of e-cigarettes, and their migration tendencies when nebulized and inhaled. Analyses of a Kiwiberries Ice e-cigarette pod liquid and nebulized vapor revealed the presence of methanol, ethanol, diacetyl, propylene glycol (solvent), nicotine, and 50+ unidentified components; water was absent. To evaluate migration of the e-cigarette nebulized gas into the lung, a hollow 3D-model of an adult mouth-lung was inserted into a two-chamber vacuum system, to simulate human e-cigarette smoking. Analysis of the inhaled, nebulized vapor highlight the presence of all components of the original liquid, with 18ppm diacetyl inhaled in three puffs. Using fluorescein-doping of the pod liquid, UV-imaging of the mouth-lung (post-smoking) highlights re-condensation of the inhaled vapor throughout the oral cavity, and in the bronchial tree. These re-condensed liquid droplets contain nearly all 50 pod components; those within the oral cavity are ingested, while droplets in the bronchioles pose a threat to alveolar function. While the health risks for the 50+ unidentified inhaled/ingested e-cigarette vapor components are still unexplored, this research highlights the migration of e-cigarette toxins throughout the human lung, and details the threat of diacetyl, which is present in sufficient quantities to cause bronchiolitis obliterans.

### Biography