



TWYST: A Bio-sanitizing Unit for Developing Countries

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Abstract

- Lack of proper legislation and resources for medical waste sanitation in underdeveloped countries often times leads to improper disposal
- Untreated waste in landfills can result in the spread of pathogens and diseases to people, animals, and sources of water that come in contact with the waste
- TWYST is a novel solution that replaces traditional test tube caps with caps that can sanitize pathological waste
- Comparable to existing chemical disinfection methods in cost effectiveness and efficiency with significantly lower environmental impact
- Design is compatible with existing test tubes, user-friendly with low failure rates, and minimal operational training
- Beneficial for hospitals and clinics in developing countries

Clinical Need

- Total amount of pathological waste could reach upwards of 1,000,000 kg generated per day^{1,2}
- An estimated 5.2 million people die from waste-related diseases per year around the world³
- Currently, there are no cost-effective, safe methods to dispose of medical waste in developing countries
- Incineration releases harmful chemicals into the environment⁴
- Need to decrease exposure to pathological waste and to stop the potential spread of disease by allowing pathological waste to sit in landfills

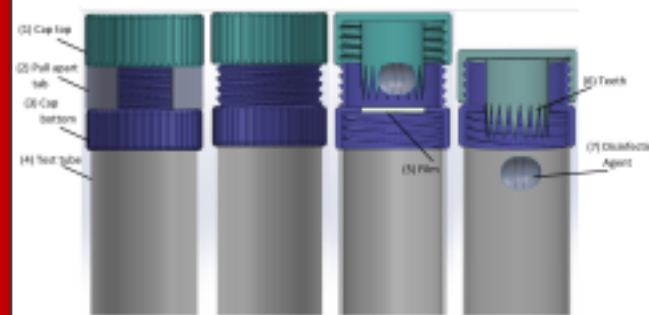
Description of Market

- Target end users include healthcare workers operating at hospitals, blood banks, and medical research divisions in developing countries
- To supply our cap design with sterile test tube supplies for end users, key customers include plastic test tube suppliers
- Target companies include Thermo Scientific and Desco (India)
- Integrating the cap design to match universal threading sizes for test tubes, the cap can be manufactured and sold independently

Description of Design

Design Requirements:

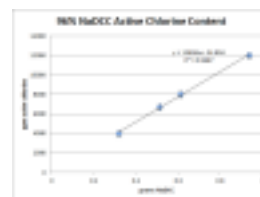
- Must quickly, efficiently, and safely disinfect pathological waste
- Not dangerous to waste handlers
- Comparable efficiency to autoclaving
- Comparable cost to incineration



Evaluation Testing

DPD-FAS Titration Method:

Target concentration of 10,000 ppm for disinfecting blood pathogens was achieved with 0.77 g of powdered sodium dichloroisocyanurate (NaDCC)

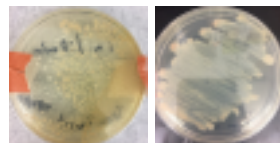


Bacteria Growth Test:

Motivation - to prove successful killing of bacteria

Methods - *E. coli* added to blood and treated with various quantity of NaDCC

Result - No bacteria growth observed after 3 days, only dead organic material



Comparison to Existing Solutions

Leading alternative solutions⁴:

	Incineration	Autoclaving
Cost	\$2,000 - \$1600,000	\$36,000 - \$89,000
Environmental Impact	Water and soil contamination likely	May impact on water quality
Primary Setting	Primarily used in developing countries	Primarily used in developed countries

- Specific components of our device are novel
- Only one patented device similar to our device⁵
- Not commercially sold by medical supply companies
- Estimated cost for mass manufacturing TWYST:

Part Description	Cost for 100,000 Units
Bottom Cap	\$1,000
Top Cap	\$1,000
Film	\$24.98
Disinfectant	\$650
Machinery Costs	\$22,500
Total:	\$25,174.98

- Unit cost of TWYST is \$0.25

Future Work

- Talk to local healthcare workers about the ease of use of the cap and any suggestions they have
- Continue bacteria growth tests to ensure accuracy and repeatability of the test
- Look into cap production for vacutainer tubes

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