Deposition of Drug-delivering Bandages via a Combined Electrostatic and Air-Driven Electrospinning Device

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**Introduction**

- Electrospinning (ES) is an affordable manufacturing process to produce nanoscale, polymer fibers.
- During ES, a high voltage differential is required to draw out polymer fibers from a polymer solution at a charged spinneret.
- Fibers produced are then deposited onto an oppositely charged electrode.
- ES typically requires large, immovable equipment and conductive surfaces for deposition of fibers.
- Portability and on-demand ES of fiber mats onto non-conductive surfaces would enable use in remote locations with limited access to medicine.

**Methods & Materials**

- A portable ES device with the ability to deposit fiber mats onto non-conductive surfaces, including skin, was used to fabricate fiber bandages.
- Fiber bandages were made using biocompatible polymer and solvents.
- Bandages were manufactured by either transitional or direct deposition.
  - Transitional deposition uses conventional ES methods to deposit onto conductive surfaces.
  - Direct deposition allows the user to deposit onto any type of surface.
- The antibiotic vancomycin was used to measure effective drug-delivery to *Staphylococcus aureus* (S. aureus) bacterial lawns.
- Gold nanoparticles were dispersed within polymer solution to measure release of encapsulated materials using ultraviolet-visible spectroscopy (UV-Vis).

**Results**

- Drug-delivering bandages were deposited onto bacterial lawns using both direct and transitional deposition methods.
- Vancomycin was released after bandage degradation and killed surrounding bacteria areas.
- Gold nanoparticles were released from fabricated bandages via UV-Vis performed on a dissolved bandage.
- The portable ES device successfully demonstrated fabrication of several biomedically relevant electrospun materials that can be deposited directly or fabricated and stored for later use.

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**Student Profile**

Lane Huston

I am a graduate student in the General Engineering—Mechanical Option program originally from Missoula, MT. I am graduating this upcoming summer and hope to continue working in nanotechnology and related fields in the near future.