
TIP Project Brief – 100019/11H003

Manufacturing **Atmospheric Spray Freeze Dried Powder Process Advancement and Scale-Up**

Scale up and demonstrate a commercially viable production line employing a novel freeze drying process to prepare complex biomolecules in powder forms that simplifies the storage and delivery of emerging, protein-based pharmaceuticals.

Sponsor: Engineered BioPharmaceuticals, Inc.

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- Project Performance Period: 2/1/2011 - 1/31/2014
- Total project (est.): \$5,977 K
- Requested TIP funds: \$2,988 K

Engineered BioPharmaceuticals, Inc., a small start-up company, plans to scale up and demonstrate a commercially viable process for freeze drying protein-based pharmaceuticals in aseptic, powder forms. If successful, the company's technology could significantly simplify the use of emerging, protein-based therapies by stabilizing the drugs, extending their shelf life, and making them amenable to a variety of simple, reliable delivery mechanisms such as low cost inhalers and point-of-use devices.

Advances in biotechnology have opened up a new class of pharmaceuticals based on engineered proteins that can selectively target specific disease mechanisms with relatively few side-effects. The field, still in its infancy, has great potential to prevent or combat many diseases and provide an arsenal of therapies to counteract pandemic and bioterrorism agents. Biomolecular-based drugs, however, are large and complicated molecules that must be handled carefully to preserve their effectiveness. They generally cannot be delivered as pills or otherwise ingested because the digestive mechanism is specifically designed to break down proteins. Currently, most are injected as liquids by a less than enthusiastic patient-base. Due to the relatively short shelf life stability of liquid biomolecular-based drugs, they often require special handling, such as maintaining cold chain storage and/or clinician administration, both adding to increased cost and limiting distribution. Establishing a long shelf life through aseptic processing into dry powders is a cost effective and essential process for efficient storage of stockpiles required for epidemics and pandemics.

Engineered BioPharmaceuticals has pioneered an atmospheric spray freeze drying (ASFD) process to create high performance dry powders in controlled sizes for biomolecular pharmaceuticals. Freeze drying has been used to preserve things such as blood serum since World War II, but existing commercial processes produce either solid cakes or poorly defined powders that are unsuitable for aerosol delivery and can be difficult to dissolve while maintaining therapeutic value. The project entails significant technical challenges in creating a hybrid manufacturing process that combines the characteristics of spray drying and freeze drying while maintaining a fine control over particle shape. Technical barriers to be overcome include preventing stresses on the biomolecules that damage their therapeutic value; handling aerosol distributions with particle dimensions ranging from the micron scale to the sub-micron scale without loss of expensive product (much like catching smoke and placing it in a small bottle without losing any); and performing all operations in aseptic environments.

The company proposes to build and demonstrate an integrated production line capable of manufacturing aseptic dry powders and filling them aseptically into delivery devices. A non-pharmaceutical test material will be used to demonstrate the production and packaging of aseptic powder batches at a variety of size scales, including nanoscale particles, and particles suitable for pulmonary delivery, nasal delivery, and reconstitution. The company also will produce a recombinant protective antigen vaccine powder to demonstrate the process' potential with actual proteins.

For project information:

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