Product Design Specification

Title: Converting Elastin-Like Polypeptide (ELP) aggregate into soluble form

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Function: Elastin-Like Polypeptides (ELPs) may serve as promising drug-delivery agents to treat various types of cancers. After harvesting ELPs from bacteria, ELPs become aggregated. In order for our client, Dr. Furgeson, to conduct research on ELPs, soluble form of ELP is required. ELP aggregation depends on temperature and salt concentration. Our device should efficiently convert ELP aggregate to soluble form.

Client Requirements:

- Device should be automated and require minimal manual labor.
- At least 80% of ELP should be recovered after it is converted into a soluble form.
- PBS should be used as the solvent in minimal amounts.
- Accommodate test tube (10.3 cm x 2.8 cm)

Design Requirements:

1. Physical and Operational Characteristics

    a) *Performance Requirements*
    The design should be able to resolubilize ELP harvested from 4 liters of bacteria (1 liter of bacteria yields approximately 180 mg of ELP).

    b) *Safety*
    The device should have no exposed sharp edges that harm the user. Any moving parts should be shielded to prevent the user from harm and all electrical elements should be contained to prevent unwanted shock or contact.

    c) *Accuracy and reliability*
    The final ELP solution should be uniform in concentration with complete resolublization. Concentration uniformity will be measured by a spectrophotometer three times to verify concentration. Complete

resolublization will be measured visually with total rehydration of aggregate pellet.

d) *Life in service*
The device should function normally for a minimum of 5 years if kept in optimal conditions.

e) *Operating Environment*
Device will be used in a normal laboratory setting.
- Normal room temperature operation (~22°C) for the majority of product life, but should continue to function normally within temperature range of 2°C to 30°C.
- Normal pressure ("the standard atmosphere" (1 atm) = 101.325 kPa)
- Low humidity
- Dirt and dust levels are low and negligible
- Fluid corrosion will may be a factor, as the laboratory setting may produce volatile fluid that could affect the product
- Vibrations from device or other equipment may cause loosening and detachment of parts and should be inspected regularly

f) *Ergonomics*
The device should be user friendly and easy to clean. Sterile equipment is a must, so design should allow for easy and quick cleanup to be ready for multiple batches. The device should be easy to hold (if handheld) and not require extraneous movement to operate.

g) *Size*
The device should fit in a 1 meter x 1 meter laboratory bench top. The height of the device should not exceed 0.5 meters.

h) *Weight*
The weight of the device should not exceed 20 pounds.

i) *Materials*
The materials should withstand the temperature range mentioned earlier in this PDS. The materials should withstand forces applied to it from motion, test tubes, or ELP. For example, if a motor is incorporated, it should be powerful enough to withstand any forces applied to the attached mechanism.

j) *Aesthetics, Appearance, and Finish*
The chamber, in which the ELP solution will be made, should be transparent. Product is not required to be aesthetically pleasing as long as functional conditions are met.

2. Production Characteristics

    a) *Quantity*
    Only one unit is desired.

    b) *Target Product Cost*
    The total product cost should be less than $100.

3. Miscellaneous

    a) *Customer*
    Our client prefers that the resolubilization process takes less than 3 hours. Also, the client would like the final product to be as concentrated as possible.

    b) *Competition*
    Many kinds of laboratory mixers, shakers, emulsifiers, and vortexers are available through equipment supply companies including Bionexus, Diager, and IncubatorShaker. This equipment is not currently ELP specific, and costs anywhere from $200 to $2500 each.