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Product Design Specifications

Title: Interpenetrating Networks for delivery systems

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Function: Interpenetrating networks (IPNs) are a type of biomaterials that polymerize in situ and have been used in drug delivery, wound healing, and tissue engineering applications. This design project involves the development of novel delivery mechanisms that should be clinically easy to use with improved storage life. Our solution should safely, efficiently, and accurately aid in the administration of IPNs to a specific region.

Client requirements: Our client wishes to dehydrate the IPN to a powder form, so that the powder can be stored interminably/for a prolonged timeframe in a spray bottle and reconstituted with water at the time of use. He hopes that this development will make the product easier to use and that it will have a much longer shelf life, although determining what the shelf life is will not be expected of us during this term. Topics to consider will be the appropriate component concentrations, the method of dehydration, as well as the viscosity of the resulting IPN and its effects on both UV curing time along and the ability to spray the solution through a narrow tube.

Design requirements:

1. Physical and Operational Characteristics

a. *Performance requirements*

Powder solution must have the correct molecular weight that when reconstituted creates a desirable spraying viscosity. Mixing procedures should also be relatively straightforward. Final solution should be cured within 60 seconds under UV light after application to wound.

b.*Safety*

Chemical properties of the original IPN should not be compromised. The final solution or any of the initial chemical components should not inflict any harm on the patient or medical personal making or applying the IPN.

c. *Accuracy and Reliability*
Mixing procedures should be relatively straightforward to minimize human error. Molecular formula should be standardized between bottles. Final solution should have a uniform consistency and viscosity suitable for spray application.

d. *Life in Service*
Each bottle will be single use.

e. *Shelf Life*
Multiple years as desired, however this is not a strict requirement.

f. *Operating Environment*
Product will only be used in a sterile environment such as hospital operating rooms and emergency rooms. Future innovations may lead to over-the-counter distribution.

g. *Size*
Size of spraying apparatus may vary with a maximum volume of 20 mL.

j. *Materials*
Components of formula will include citrate buffer, 90-110 bloom gelatin, PEG-dA, EDTA, I2949, diH20, 8 oz. spritzer bottle, anti-inflammatories.

k. *Aesthetics, Appearance, and Finish*
An opaque bottle for photoinitiator preservation. Product must be well-labeled.

2. Production Characteristics

a. *Quantity*
Only one unit is desired.

b. *Target Product Cost*
Modifications should not exceed 5% of the total overall cost of approximately $200.

3. Miscellaneous

a. *Standards and Specifications*
FDA re-approval may be necessary.

b. *Customer*
Various medical institutions.

c. *Patient-related concerns*
Trapping foreign objects in solution before administration. Sterile packaging.

d. *Competition*
Current bandage technology, including those with silver nitrile/cotton gauze, and Kristyn Masters, Ph.D.