Spider Silk is one of the most unique fibers produced in the natural world. Its mechanical properties are unparalleled and have the potential to revolutionize industries around the globe. However creating this silk as it exists in nature, is difficult. Due to inability to farm orb weaving spiders that produce silk, other hosts must be inserted. This is the point of emphasis at the Spider Silk Research lab at the BioInnovations Center at Utah State University. Hosts that are currently being researched are; Silkworms, E Coli, Alfalfa, and Goats. Each of these hosts is unique in its ability to produce silk products similar to the spiders, and these differences present strengths and weaknesses that are the focus of the experimentation process. I have been fortunate enough this semester to work with graduate student Micheala Hugie on the Alfalfa host. Alfalfa has already proven its ability to produce Spider Silk, however our goal is to produce a larger protein that would be similar to and produce the properties of natural spider silk.

**Alfalfa Potential**

Spider Silk is made of an long sequence of proteins between 250 to 500 kDa. This makes it incredibly difficult to replicate due to inability of natural vectors to effectively produce a protein this size. Alfalfa is the solution to this problem, because it naturally builds proteins that are similar in size. This makes it the perfect host in which to insert a foreign spider silk strand. The process has already proven successful, but as it's yield increases, protein size is increased, and processing costs are lowered, it could prove to be the host of the future in the production of spider silk.

**Abstract**

Spider Silk is one of the most unique fibers produced in the natural world. Its mechanical properties are unparalleled and have the potential to revolutionize industries around the globe. However creating this silk as it exists in nature, is difficult. Due to inability to farm orb weaving spiders that produce silk, other hosts must be inserted. This is the point of emphasis at the Spider Silk Research lab at the BioInnovations Center at Utah State University. Hosts that are currently being researched are; Silkworms, E Coli, Alfalfa, and Goats. Each of these hosts is unique in its ability to produce silk products similar to the spiders, and these differences present strengths and weaknesses that are the focus of the experimentation process. I have been fortunate enough this semester to work with graduate student Micheala Hugie on the Alfalfa host. Alfalfa has already proven its ability to produce Spider Silk, however our goal is to produce a larger protein that would be similar to and produce the properties of natural spider silk.

**Setbacks**

Despite being a host capable of producing spider silks approximately the size they are produced in nature, alfalfa does have its setbacks. Due to an approximate 60 days generation time, the plants do not produce silk at a rate suited for commercialization. In addition, the vector in which the silk sequence is ligated is not genetically favorable to the plant and consequently will not be naturally selected overtime as new generations grow. These issues are difficult, but perhaps the most large issue is the world few on genetically modified organisms. Despite not expressing any negative side effects of being genetically modified, the scientific community as a whole is moving away from similar practices due to lack of funding. An issue that may leave the alfalfa as part of a closed chapter in the history of spider silk research.

**Techniques Used**

- Overnight Cultures
- Digests
- Ligations
- Electro Competent Transformations
- Chemical Competent Transformations
- Plating
- PCR Purification
- Sonication
- Heat Shock Therapy
- Flask Cultures
- Gel Extractions
- Western Blots
- Alfalfa Transfers
- Protein Extraction

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