Kevin Lundgren

Daniel Lundgren

Patrick Lundgren

Project Roles

Kevin Lundgren

Scientific Leader

Extensive research experience and understanding of what it takes to be successful in the lab. Will be responsible for conducting research, analyzing data and recruiting potential partners.

Education and Experience:

2012 Northeastern University graduate, currently pursuing a Master's Degree in Bioinformatics at Lund University (Sweden). Has several years of relevant lab research experience, having worked both in industry (Merck, Genzyme) and academia.

Daniel Lundgren

Business Leader

Passionate about both the science and the business of biotech innovation. Will manage the business aspects of the team with an understanding of what it takes to bring a product to market.

Education and Experience:

Sophomore in the Vagelos Program in Life Sciences & Management. Engaged in research projects on campus ranging from precision medicine in the clinic to understanding the molecular basis of disease.

Patrick Lundgren

Scientific Leader

Passionate about the application of knowledge for the purposes of creative experimentation and problem-solving. Responsible for investigating protein engineering approaches in the development of technology platform.

Education and Experience:

Second-year science undergraduate student at Cambridge University, concentrating in Biochemistry. Has held several lab research positions during the academic year and summers with experience in protein engineering approaches.

Problem - Unmet Need

Diabetes

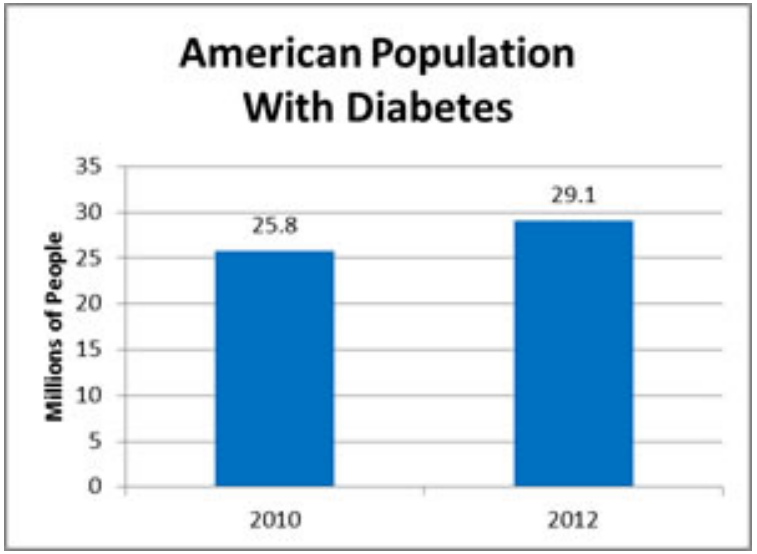
- 29.1 million people have diabetes in the US (9.3% of population), 8.1 million of which are undiagnosed
- Estimated diabetes cost to society exceeds $450 billion

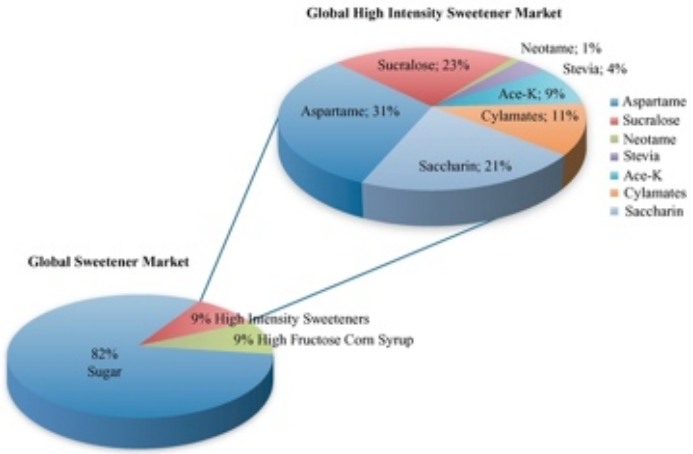
⟶ There is large demand for diets that meet the preferences and nutritional needs of these patients

In General

- The food sweetener global market recorded $84 billion in 2014 and is estimated to increase at a CAGR of 4.5% and reach nearly $111 billion by 2020
- There is a strong global consumer demand for safe and natural high-intensity sweeteners (HIS), which is the fastest growing segment of this market (expected to reach nearly $2.2 billion in 2020 at a CAGR of 5.1%)

⟶ This growth is due to increased awareness and preference for dietary foods. As noted above, another major driver is the growing population of obese and diabetic patients.





Sources: National Diabetes Statistics Report, 2014 (CDC), U.S. Securities and Exchange Commission, Research and Markets: "Global Food Sweetener Market – Growth, Trends, Forecast For The Period 2015-2020"

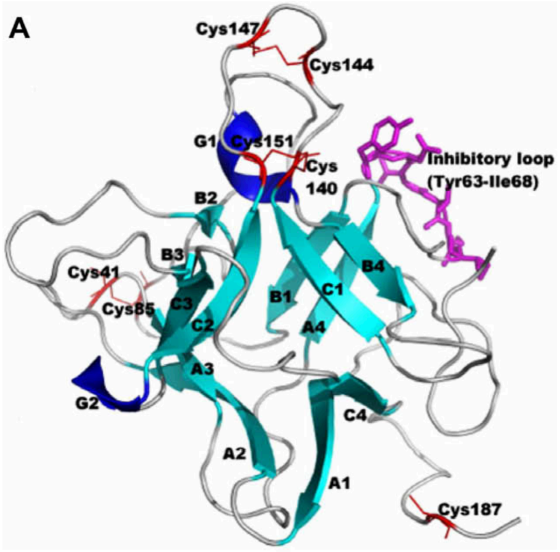
Technical Explanation of Novel Idea

Miraculin

Miraculin is a protein that binds reversibly to sweet receptors, and when exposed to acidity, changes conformation to activate the receptor – making sour things taste sweet, actively deceiving the sweet receptor. Recent research in Japan shows that miraculin can be mass-produced in transgenic plants. We plan to work with the miraculin protein given its potential to revolutionize the sweetener market.

Steps to make idea reality:

- **Collaborate with Penn faculty with extensive experience in plant biotechnology research (Dr. Henry Daniell, Dr. Philip Rea), to develop novel expression system in chloroplasts of transgenic plants (lettuce) to optimize mass-production of miraculin.**
- **Investigate the application of directed evolution approaches (protein engineering) to increase the heat-stability of the protein to allow for its use in food that needs to be cooked.**
- **Investigate the application of rational protein design (protein engineering) to develop a modified and novel protein that induces a sweet sensation when consumed at an elevated or reduced temperature (applications in warm beverages and ice cream).**



Sources: Gahloth D, Selvakumar P, Shee C, Kumar P, Sharma AK (February 2010). "Cloning, sequence analysis and crystal structure determination of a miraculin-like protein from Murraya koenigii". *Arch. Biochem. Biophys.* 494 (1): 15–22.

Misaka, Takumi. "Molecular mechanisms of the action of miraculin, a taste-modifying protein." In *Seminars in cell & developmental biology*, vol. 24, no. 3, pp. 222-225. Academic Press, 2013.

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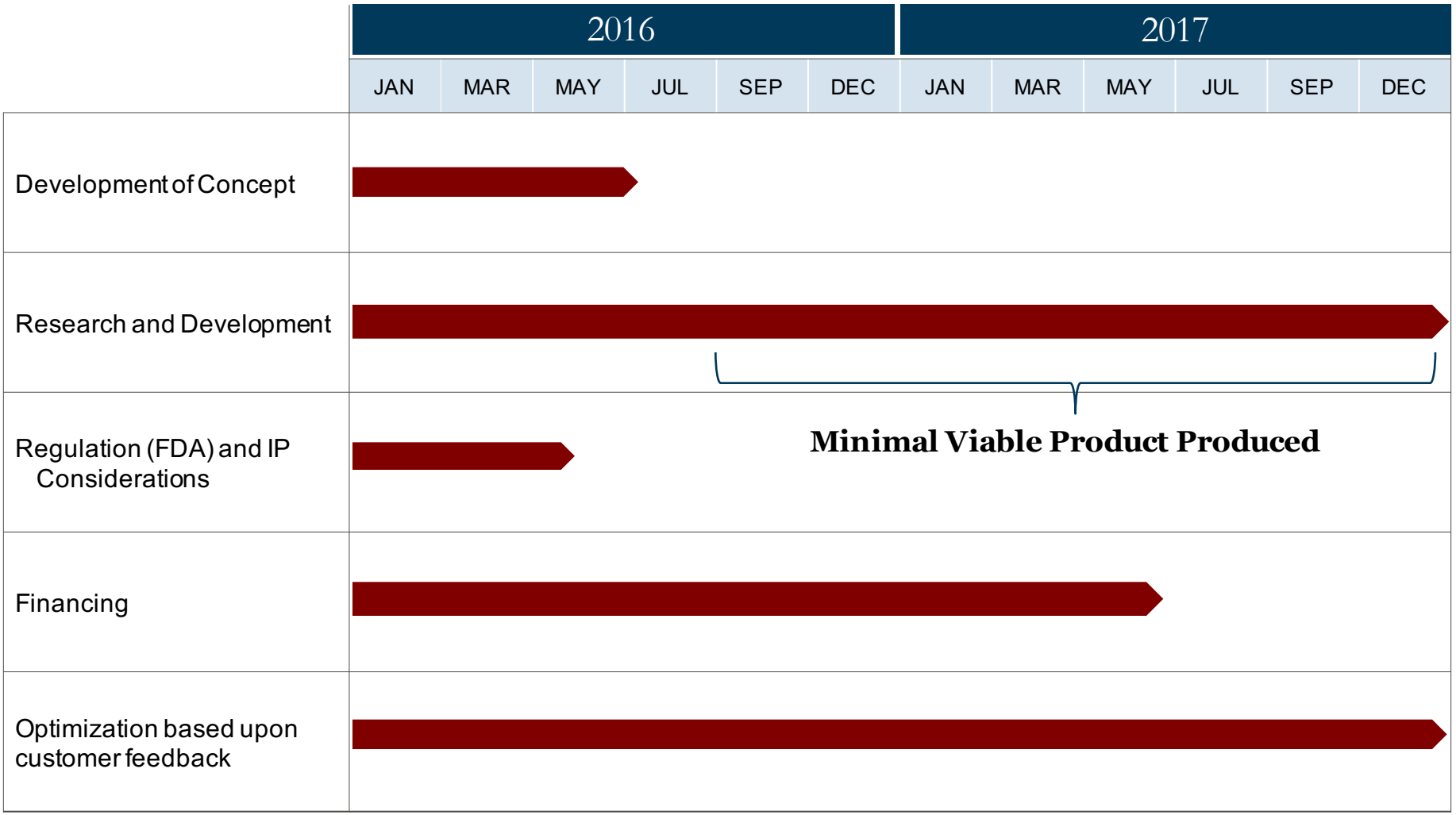
Timeline


2016
2017
JAN
MAR
MAY
JUL
SEP
DEC
JAN
MAR
MAY
JUL
SEP
DEC
Development of Concept
Research and Development
Regulation (FDA) and IP Considerations
Financing
Optimization based upon customer feedback
Minimal Viable Product Produced