Team Demeter: Production of Larazotide Acetate

Julian Iturbe, Annie Needs, David Mayor, Larisa Tomeci (Team 21)
Project Advisor: Dr. Andrew Wilson

Calvin UNIVERSITY 1876

Introduction

Celiac disease is an inherited autoimmune disease that causes damage to the small intestine when gluten is ingested. Research shows that up to 30% of celiac disease patients have persistent symptoms even while on the gluten-free diet. Our design goal is to **design a scale-up facility for the production of Larazotide acetate**, a potential medicine for Celiac disease. The drug acts as a tight junction regulator, binding to the receptors of apical intestinal cells and preventing the opening of epithelial intestinal tight junctions. This reduces the gluten intolerance and the non-gluten intolerance symptoms of celiac disease. The drug must be accompanied by a gluten-free diet.

Objectives

- Design scale up facility for the production of Larazotide acetate
- Minimize cost of production, reducing current price of drug of 50 USD per 1 mg
- Limit resources consumed in the production process
- Reduce environmental waste and impacts
- Develop a chemical plant safely plan
- Produce 25-33% of production market
- Determine optimal location for the production facility

Team Demeter (left to right):
Annie Needs, Julian Iturbe, David Mayor, Larisa Tomeci

Approach

In order to design a scale up plant for the production of Larazotide acetate , we chose the approach that **maximizes the profit while reducing the carbon footprint of the production process** in our design. We designed a semi-batch reactor to synthesis the peptide bonds in a specific orientation. The product is then extracted and washed and then purified through crystallization.

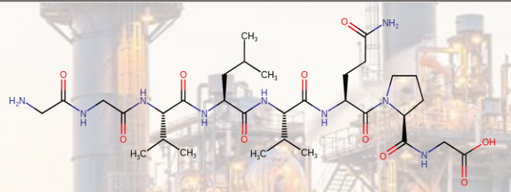
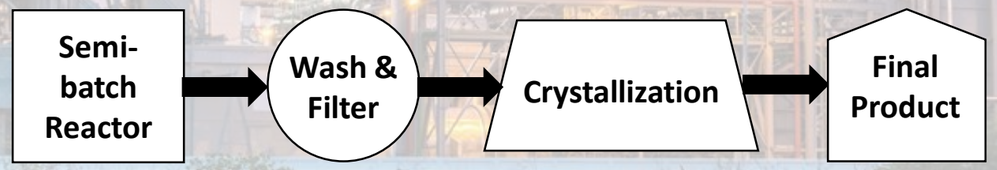


Figure 1. A model of the molecular structure of Larazotide Acetate.

Simplified Process Flow Diagram



Decisions

To fulfill our objectives and meet the professional expectations of this project, we have made the following decisions and chose the following operating conditions:

- Semi-batch reactor
- Crystallization as purification technique
- India as optimal location
- Europe and Australia as the main consumers
- Comply to the EU regulations

Design Norms

The design norms we hope to focus on in our project are:

- Caring
- Trust
- Stewardship

References and Acknowledgments

Dr. Andrew Wilson
Professor De Rooy
Professor Hartemink
Professor Michmerhuizen
Calvin University, Engineering Department