Internship at Empirical Bioscience

Brett Brockman: Cellular and Molecular Biology Graduate Program - Biotechnology Emphasis. Grand Valley State University

Abstract

The Cellular and Molecular Biology Department's graduate program at Grand Valley State University has two different emphases: Biotechnology or Thesis Research. The Biotechnology emphasis gives a more hands on experience in the work field by allowing students to work in a professional lab setting. I did my internship at Empirical Bioscience, formally known as Syzygy Biotech, from May 2013 through January 2014. Empirical Bioscience's main focus is to create products for the Polymerase Chain Reaction (PCR) method. This included buffers, master mixes, and Taq DNA Polymerase. The greatest challenge for me was working in a fast pace environment where multiple projects were done at the same time. I had many different responsibilities in the company, but I was mainly involved in purifying Taq DNA Polymerase and quality control. I purified many batches of Taq DNA Polymerase, which were sold, and are being used in biology labs across the Midwest. With my experience at Empirical Bioscience, I was able to improve my laboratory skills, create/improve protocols, test the products made, and learn how a biotechnology operates as a whole instead of being limited to just one aspect of the company.

What Empirical Bioscience does

Located on the 5th floor of the Devos Center for Health Sciences building in downtown Grand Rapids.

Specializes in creating products for PCR that are distributed throughout the Midwest.

Examples of products sold by Empirical Bioscience include:

- Taq DNA Polymerase
- MeanGreen Master Mix
- FlashTaq DNA Polymerase
- rEVAlution Master Mix

Protein Purification

Step 1: Grow and inoculate modified *E.coli* to mass produce Taq DNA Polymerse.

Step 2: Lyse cells and isolate protein.

Step 3: Run Protein through ion exchange column.

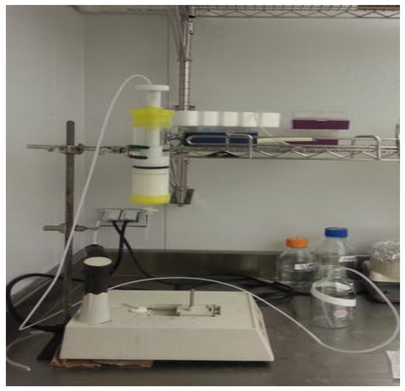

Figure 1. The ion-exchange column that elutes the Taq DNA Polymerase, which is collected by the fraction collector.

Step 4: Set up BCA plate to estimate where the protein was eluted.

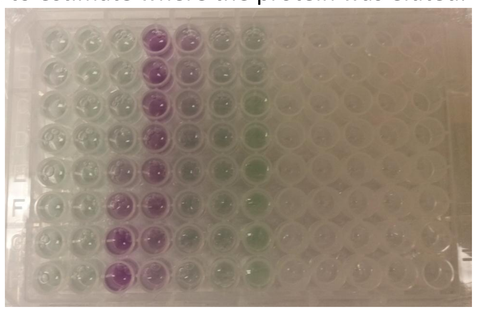

Figure 2. BCA plate performed to determine which eluted fractions contain any protein.

Step 5: Perform SDS-Page gel to determine exact location of the enzyme.

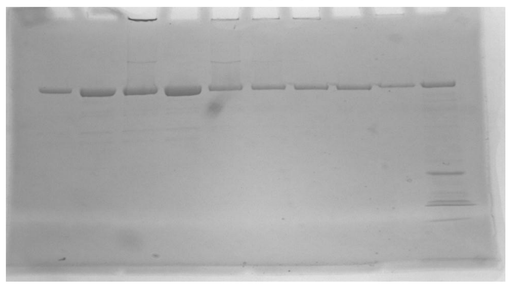

Figure 3. SDS-Page gel is used to confirm the location and concentration of the enzyme. The highest concentrated fractions are pooled together for dialysis.

Step 6: Dialyze Taq DNA Polymerase with or without glycerol.

Step 7: Determine concentration of enzyme by BCA assay.

Quality Control

- Done before any products are sold.
- Products must be working effectively.
- Free of foreign DNA or Nucleases.

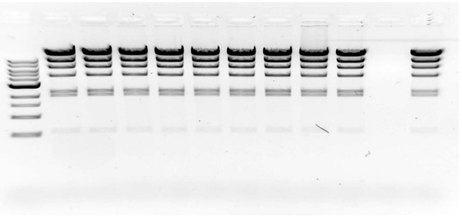

Figure 4. Nuclease Detection assay to test for the presence of DNase and RNase.

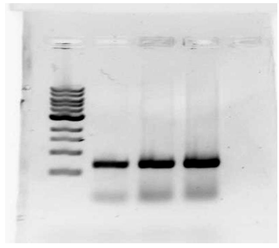

Figure 5. Activity Assay to determine if a PCR component functions properly. Assay performed for Taq DNA Polymerase, Master Mix solutions, dNTPs, buffer, etc.

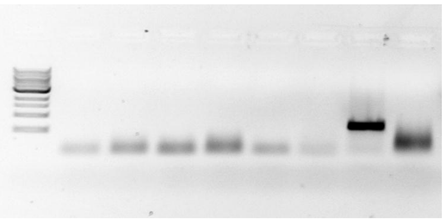

Figure 6. Contamination assay to test for foreign Human and *E.coli* DNA.

What I learned

- Documentation is extremely important.
- Operations of a biotechnology start-up.
- Enhance and learned laboratory skills.
  - Protein Purification
  - Column Chromatography
  - Various PCR
  - Spectrophotometry

Acknowledgements

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brockmab@mail.gvsu.edu
(920) 585-5614