

# HPLC for the Ethanol Production Laboratory

High Performance Liquid Chromatography (HPLC) is now a commonly used technique for monitoring the progress of the fermentation in the ethanol production laboratory through the use of highly efficient column materials (the stationary phase), pumping systems that provide a consistent flow of the mobile phase, and detection components designed to accommodate the needs of the analysis.

The HPLC system is typically used to profile the carbohydrate, alcohol, and organic acid content of the fermentation broth.

Components typically used to perform the fermentation process include\*:

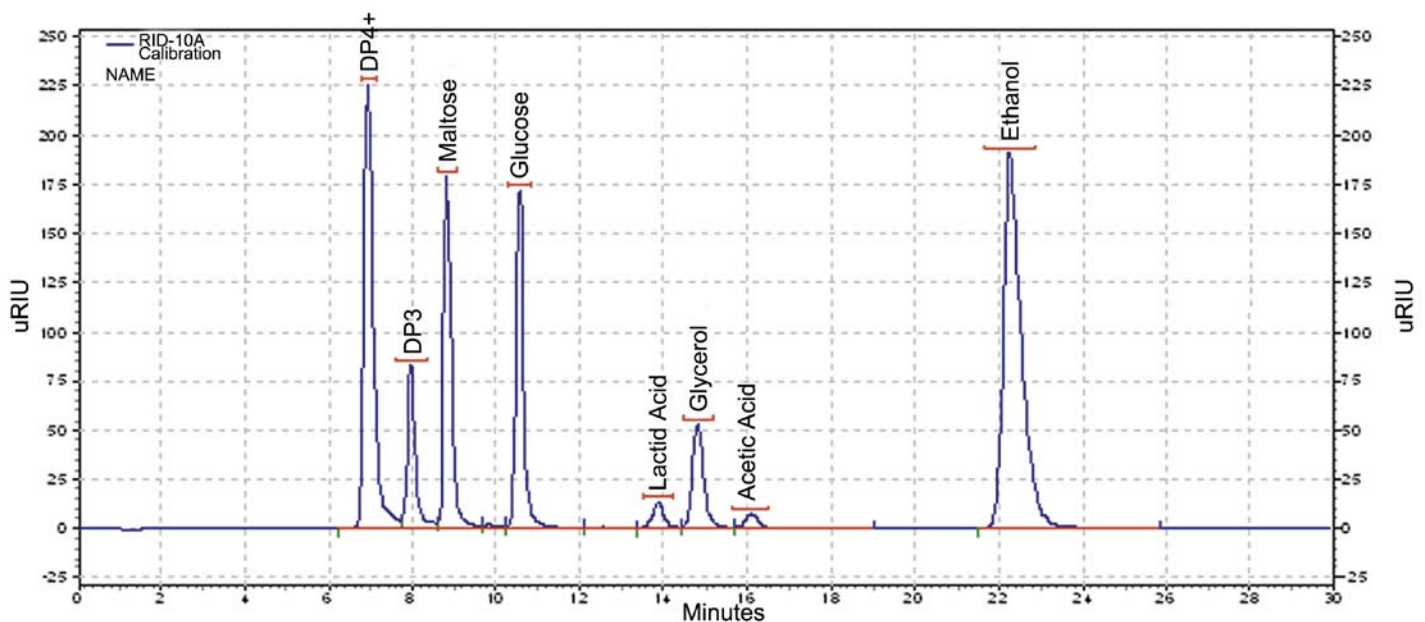
- Mobile phase
- Isocratic pumping system
- Autosampler for sample introduction
- Analytical column
- Refractive index detector
- Data acquisition system

*\* Most systems also include a mobile phase degasser to maintain a bubble-free mobile phase delivery, and a column heater. Lastly, many systems utilize a sample cooler to minimize ongoing sample metabolism.*

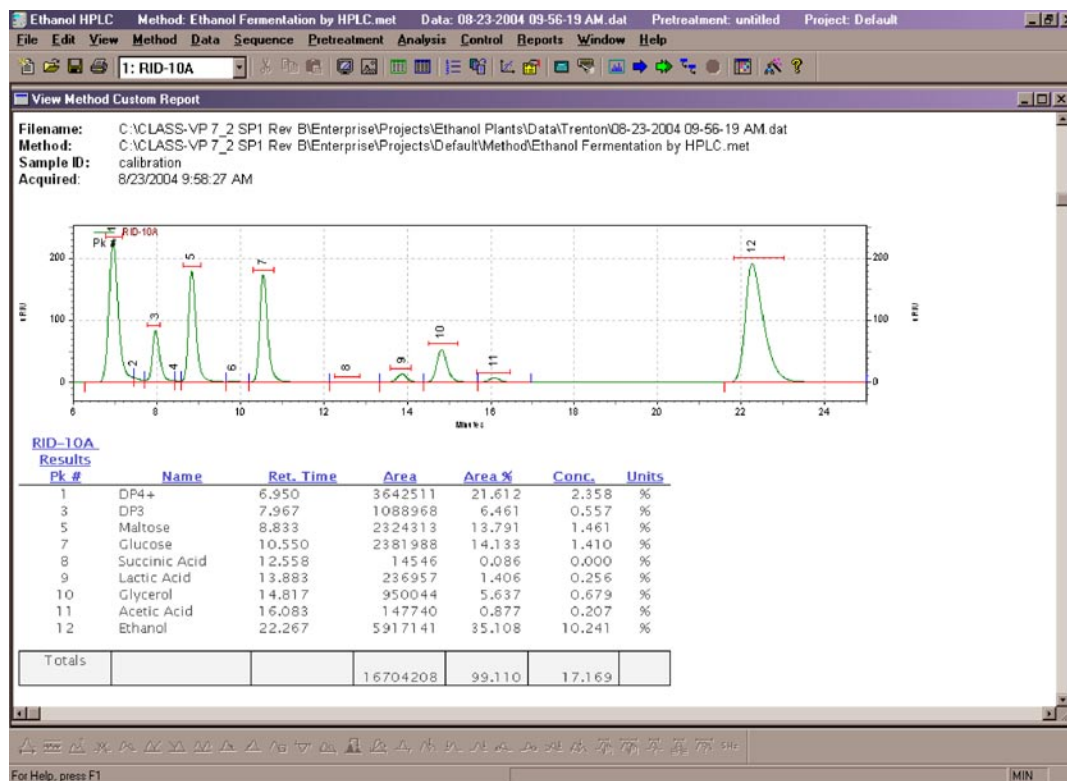


The analysis of the fermentation broth is intended to monitor the breakdown of the starch molecules into glucose, then the conversion into ethanol, following typical Krebs cycle dynamics. The fermentation can go too far if the ethanol begins to be converted into acetic acid.

Injection of a filtered broth sample is carried through the column to the detector by the dilute acid mobile phase. A typical chromatogram is shown below.



Calibration of the HPLC system by use of a standard solution of the components of interest will allow the user to obtain, directly, as weight percent for the analytes of the broth samples. This data can be used to evaluate the progress of the fermentation and what intervention may be necessary at a future time to maximize the production of ethanol and minimize the production of further oxidation products.



Contact your regional office or visit [www.ssi.shimadzu.com](http://www.ssi.shimadzu.com) to learn more about Shimadzu. In addition to best-in-class HPLC components, we offer a wide range of analytical instrumentation and a wealth of experience to equip your laboratory with a complete analysis package to meet your evolving requirements.

**MID-ATLANTIC Region**  
 Washington, DC Office  
 7102 Riverwood Dr.  
 Columbia, MD 21046  
 Phone: (410) 381-6996  
 Toll Free: (800) 388-6996  
 FAX: (410) 290-9140

**SOUTHEAST Region**  
 Raleigh/Durham Office  
 4022 Stirrup Creek Drive, Suite 312  
 Durham, NC 27703  
 Phone: (919) 425-1010  
 Toll Free: (800) 951-9167  
 FAX: (919) 544-3497

**MID-WEST Region**  
 Kansas City Office  
 8052 Reeder  
 Lenexa, KS 66214  
 Phone: (913) 888-9449  
 Toll Free: (877) 698-7923  
 FAX: (913) 888-8388

**NORTH ATLANTIC Region**  
 Boston Office  
 136 Longwater Drive  
 Norwell, MA 02061  
 Phone: (781) 878-7755  
 Toll Free: (800) 396-4943  
 FAX: (781) 878-7212

**NORTH CENTRAL Region**  
 Chicago Office  
 2055 W. Army Trail Rd., Suite 106  
 Addison, IL 60101  
 Phone: (630) 916-6286  
 Toll Free: (800) 792-1992  
 FAX: (630) 916-7160

**WEST COAST Region**  
 San Francisco Office  
 7060 Koll Center Pkwy., Suite 328  
 Pleasanton, CA 94566  
 Phone: (925) 417-2090  
 Toll Free: (800) 482-0253  
 FAX: (925) 462-7348

**NEW JERSEY Region**  
 New Jersey Office  
 262 D Old New Brunswick Rd.  
 Piscataway, NJ 08854  
 Phone: (732) 981-4400  
 Toll Free: (800) 439-8555  
 FAX: (732) 981-4420

**SOUTH CENTRAL Region**  
 Houston Office  
 10801 Hammerly Blvd., Suite 148  
 Houston, TX 77043  
 Phone: (713) 467-1151  
 Toll Free: (800) 739-1942  
 FAX: (713) 467-1153

**SOUTH CALIFORNIA Region**  
 Carlsbad Office  
 1817 Aston Ave., Suite 105  
 Carlsbad, CA 92008  
 Phone: (760) 710-2400  
 Toll Free: (866) 862-1677  
 FAX: (760) 931-9854

