

**Equipment at the University of Iowa's Center for Biocatalysis and Bioprocessing
Process Development Laboratory**

Table 1: GLP Fermentors



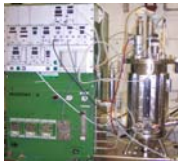





| | Working Volume, L | Model | Typical Use/Comments |
|---|--------------------------|---------------------|---|
|  | 1.5 | Biostat B | A suite of eight highly instrumented and automated fermentors with complete data logging for process optimization. |
|  | 2 | DASGIP FedBatch Pro | Fully integrated growth/product optimization, from ethanol to proteins. Clonal selection, optimization. |
|  | 10 | Biostat E | Good for process demonstration, provides initial material for downstream process development |
|  | 15 | Biostat UE20 | Computerized, provides inoculum for larger fermentors |
|  | 30 | Biostat C-DCU | Good for process demonstration, provides inoculum for large fermentors |
|  | 75 | Biostat D75 | First step scale fermentor is highly automated usually used scale-up from flasks and pilot quantity production. |
|  | 100 | Two Biostat D100 | Used for scale up studies, for process consistency, provides sufficient material for product purification, with detailed records of process parameters. |
|  | 1,000 | Biostat D1500 | Largest fermentor at CBB, with complete paper trail, automatic pH control, oxygen supply, cascading DO control, glycol cooled jacket, solvent feeding systems |

Table 2: GLP Downstream Processing Equipment (Partial Listing)

| Equipment | Model |
|--|--|
| Rotary Evaporator | Buchi 175 Buchi R153, 20-liter capacity Buchi R114, |
| Cell Disrupters | French Press Microfluidizer Dyno Mill |
| Centrifuges | Beckman J2-MC Alfa-Laval LAPX 404 Continuous Centrifuge 2 Sharples AS-26 |
| Filtration Systems | 2 Millipore, Pelicon Tangential Flow Filtration, 2 Flexstand Systems, SRT-50 Filtration System, with micro-, ultra-, and diafiltration capabilities |
| Preparative-Scale Liquid Chromatography System | Pharmacia Akta Explorer Pharmacia Akta Pilot |
| Flash Chromatography | Biotage for organic separations |
| Freeze Dryer | Virtis SQ 35EL with computer controls |

Table 3: GLP Analytical Services (Partial Listing)

| Analytical Instrument | Model |
|--|----------------------|
| High Performance Liquid Chromatography | Shimadzu HPLC |
| UV-VIS Spectrophotometer | Shimadzu 1600 UV |
| UV-VIS Spectrophotometer | Shimadzu 2100 UV |
| Biochemical Analyzer | YSI Model 2700-D |
| Liquid Chromatography System | Pharmacia Akta FPLC |
| Electrophoresis | Bio-Rad |
| Ultracentrifuge | Beckman Optima XL-70 |
| Fluorimeter | Quantech |
| Gas Chromatography System | Shimadzu |

The University of Iowa's central research facilities provide extensive analytical capabilities such as Protein Structure Facility, NMR Facility, and Center for Advanced Drug Development.