Protein Expression Systems Market: Current Landscape and Future Opportunities

Description: Advances in genetic engineering and cloning techniques have allowed isolation and expression of heterologous and recombinant proteins for research, therapeutic and industrial uses. Large scale applications such as enzyme, antibody or vaccine production require high amounts of protein. This demands that the system producing protein must be easy to culture, allow rapid cell growth and provide good yield. Various expression systems based on the machinery of bacteria, yeast, insect or mammalian cells have been developed to cater to these demands.

Protein synthesis occurs differently in prokaryotic and eukaryotic systems; the need for post translational modifications adds a level of complexity in the latter case. Newer expression systems utilising yeast and insect cells as host are gaining momentum due to favourable culture conditions and final end products. Pichia and Sf9/Sf21 host cells have emerged as the most commonly used systems in these categories, respectively. Some plant based technologies express protein rapidly, unlike the traditional methods of production in transgenic plants. Several other expression systems based on protozoa and fungi have also demonstrated effective protein expression. In addition, cell free expression systems have also been developed and are gaining momentum in the market.

The highly lucrative biologics market presents a huge opportunity for such systems. Both large and small companies in this sector have developed proprietary recombinant protein expression techniques to carve out their own share of the multi-billion dollar market. The increasing demand for biologics has led to the involvement of various CMOs providing services in protein expression. However, there are some technical shortcomings in current platforms which need to be dealt with to maximize the available opportunity. The opportunity, overall, will continue to increase manifold with the approval of several new biologics and biosimilars in the coming few years.

The “Protein Expression Systems Market: Current Landscape and Future Opportunities” report provides an extensive study of the various expression systems commercially available for the purpose of expressing the desired proteins. Selecting an effective and reliable expression system is one of the pre-requisites for pharma companies before they start proof of concept studies for biological molecules. It is well known that a particular expression system is not suitable to express every kind of protein. As such, there are several different types of platforms available to meet the growing demand.

With an extensive pipeline of biologic drugs, protein expression systems are likely to continue to garner significant attention from the biopharmaceutical industry. The report covers various aspects such as key features of these systems, associated products, licensing and services portfolio. We have also covered specific details on CMOs manufacturing biopharmaceutical products highlighting their capabilities, geographical location, scale of operation, type of biologics being manufactured and expression systems being used.

In addition, the report highlights the future growth prospects with respect to manufacturing biological molecules. The report has analyzed the overall biologics pipeline and provided specific details on some important classes such as antibody drug conjugates (ADCs) and bispecific antibodies. In addition, the emerging opportunity presented by the ongoing development of biosimilars has been highlighted. For the purposes of the study, important stakeholders were interviewed to solicit their opinions around the upcoming opportunities and challenges which must be considered for a more inclusive growth. Examples of companies interviewed include Research Corporation Technologies, iBio and Jena Bioscience.

Sample Highlights
- Presently bacterial and mammalian cell based systems are the preferred choice for therapeutic protein expression. Bacterial systems are preferred for their low cost, high productivity and rapid results. Mammalian cells, on the other hand, have the ability to generate proteins with folding and post-translational modification identical to native endogenous protein.

- A number of new host systems have come into the market offering advantages such as higher protein yield, diminishing susceptibility to viral contamination and easy scale up. Among these are yeast, insect, and
also certain plant based protein expression systems. Cell free systems have also gained momentum and allow direct manipulation of the chemical environment that rapidly generates significant amounts of the required protein.

- In addition to the well-established firms such as Agilent Technologies, Clontech, Life Technologies, Lonza, Merck Millipore, Promega Corporation and Research Corporation Technologies, several smaller companies too have developed robust proprietary expression systems. Examples (in alphabetic order) include Dyadic International, Geneva Biotech, Greenovation, iBio, Jena Bioscience, New England Biolabs, Oxford Expression Technologies, Pfenex and Scarab Genomics.

- The highly lucrative biologics market presents a huge opportunity for protein expression systems. The biologics market is considered to be worth over USD 200 billion and has an increasing number of therapeutically relevant protein based molecules in the pipeline.

- The outlook for CMOs is highly promising. The study identified over 160 biopharmaceutical CMOs (accounting for over 250 production facilities worldwide), which provide protein expression services. With around 900 biologics in the pipeline and 150 marketed products, CMOs stand to benefit tremendously from this growing trend.

- Technological improvements including the use of highly evolved expression elements such as designer promoters for obtaining higher translational efficiency, genome engineering to facilitate better homologous recombination and computer-controlled feeding algorithms are likely to further maximize output and yield.

Research Methodology:

Most of the data presented in this report has been gathered via secondary and primary research. For all projects, interviews are conducted with experts in the area (academia, industry, medical practice and other associations) to solicit their opinions on emerging trends in the market. This is primarily useful to draw out opinion on how the market will evolve across different regions and technology segments. Where possible, the available data has been checked for accuracy from multiple sources of information.

The secondary sources of information include:
- Annual reports
- Investor presentations
- SEC filings
- Industry databases
- News releases from company websites
- Government policy documents
- Industry analysts' views

While the focus has been on forecasting the market over the coming ten years, the report also provides independent view on various technological and non-commercial trends emerging in the industry. This opinion is solely based on knowledge, research and understanding of the relevant market gathered from various secondary and primary sources of information.

Chapter Outlines:

Chapter 2 provides an executive summary of the insights captured during the research. The summary offers a high level view on the present scenario of protein expression systems market and the likely growth opportunities in the future.

Chapter 3 provides a general introduction to protein expression systems. The basic concepts related to protein synthesis and recombinant protein expression in such systems have been briefly discussed. The chapter also covers an overview on different types of expression systems that are used for expressing protein along with their advantages and disadvantages.

Chapter 4 presents a comprehensive list of expression systems, categorized based on the host cell in which the protein is expressed. In addition, it also lists the expression systems being developed by various academic institutes.

Chapter 5 provides additional details on some expression systems which are relatively more popular within each specific category. Each profile highlights the key attributes such as yield, time to express protein, quality of product, associated cost, scale-up and culture requirements.
Chapter 6 presents profiles of 12 leading companies in this domain. Each company profile includes information such as company overview, financial performance, expression systems, product portfolio and licensing and partnership agreements made with other companies.

Chapter 7 elaborates on the participation of contract manufacturers in biopharmaceuticals manufacturing. This chapter includes an extensive analysis of CMOs and highlights their geographical location, manufacturing capabilities in terms of type of biologics manufactured and scale of operation, expression systems used and fermentation capacity.

Chapter 8 focuses on highlighting the opportunity areas for companies with proprietary expression systems. It provides a detailed overview on biologics currently being developed and specifically covers the pipeline of some of the important drug classes such as antibody drug conjugates and bispecific antibodies. We have also highlighted the opportunity presented by biosimilars, a key growth prospect for developers of expression systems.

Chapter 9 provides analysis of the strengths, weaknesses, opportunities and threats in the protein expression systems market. This section captures key elements likely to influence future growth in the industry.

Chapter 10 summarizes the overall report. This chapter provides a recap of the key takeaways and independent opinion based on the research and analysis described in previous chapters.

Chapter 11 provides three interview transcripts based on discussions with senior stakeholders in the industry. The companies interviewed included Research Corporation Technologies, iBio and Jena Bioscience.

Chapters 12 and 13 are appendices and provide the list of companies and tabulated data for all the figures presented in the report.

Contents:

1. Preface
   1.1. Scope of the Report
   1.2. Research Methodology
   1.3. Chapter Outlines

2. Executive Summary

3. Introduction
   3.1. Chapter Overview
   3.2. Protein Synthesis: An Overview
   3.3. Recombinant Protein Production in Expression Systems
   3.4. Protein Expression Methods
       3.4.1. In Vivo Protein Expression
           3.4.1.1. Mammalian Protein Expression System
           3.4.1.2. Bacterial Protein Expression System
           3.4.1.3. Yeast Protein Expression System
           3.4.1.4. Insect Protein Expression System
           3.4.1.5. Plant Protein Expression System
           3.4.1.6. Protozoan Protein Expression System
           3.4.1.7. Algae Protein Expression System
       3.4.2. In Vitro (Cell Free) Protein Expression
   3.4.3. Chemical Protein Synthesis
   3.5. Comparison of Commonly Used Expression Systems

4. Market Overview
   4.1. Chapter Overview
   4.2. Mammalian Expression Systems
   4.3. Bacterial Expression Systems
   4.4. Yeast Expression Systems
   4.5. Insect Expression Systems
   4.6. Plant Expression Systems
   4.7. Cell-Free Expression Systems
4.8. Other Expression Systems
4.9. Universities with Proprietary Expression Systems

5. Expression Systems: Key Features and Products
5.1. Chapter Overview
5.2. Well-Known Mammalian Expression Systems
  5.2.1. PER.C6 Technology (Crucell / Janssen)
    5.2.1.1. Granted Patents
    5.2.1.2. Key Features
    5.2.1.3. Products
    5.2.1.4. Licensing and Services
  5.2.2. GS Gene Expression System (Lonza)
    5.2.2.1. Key Features
    5.2.2.2. Products
    5.2.2.3. Licensing and Services

5.3. Well-Known Bacterial Expression Systems
  5.3.1. Pfenex Technology (Pfenex)
    5.3.1.1. Granted Patents
    5.3.1.2. Key Features
    5.3.1.3. Products
    5.3.1.4. Licensing and Services
  5.3.2. XS Bacillus Expression System (Lonza)
    5.3.2.1. Key Features
    5.3.2.2. Comparison of XS Expression Systems
    5.3.2.3. Products
    5.3.2.4. Licensing and Services

5.4. Well-Known Yeast Expression Systems
  5.4.1. Pichia Secretory SUMOstar Expression System (LifeSensors)
    5.4.1.1. Granted Patents
    5.4.1.2. Key Features
    5.4.1.3. Products
    5.4.1.4. Licensing and Services
  5.4.2. Pichia Glycoswitch Protein Expression System (Research Corporation Technologies)
    5.4.2.1. Key Features
    5.4.2.2. Products
    5.4.2.3. Licensing and Services

5.5. Well-Known Insect Expression Systems
  5.5.1. Bac-To-Bac Baculovirus Expression System (Invitrogen / Life Technologies)
    5.5.1.1. Key Features
    5.5.1.2. Products
    5.5.1.3. Licensing and Services
  5.5.2. Drosophila Expression System (Invitrogen / Life Technologies)
    5.5.2.1. Key Features
    5.5.2.2. Products
    5.5.2.3. Licensing and Services
  5.5.3. BacPAK Protein Expression Systems (Clontech)
    5.5.3.1. Key Features
    5.5.3.2. Products
    5.5.3.3. Licensing and Services
  5.5.4. flashBAC Expression System (Oxford Expression Technologies)
    5.5.4.1. Granted Patents
    5.5.4.2. Key Features
    5.5.4.3. Products
    5.5.4.4. Licensing and Services
5.6. Well-Known Plant Expression Systems
5.6.1. BryoTechnology (Greenovation Biotech)
  5.6.1.1. Key Features
  5.6.1.2. Products
  5.6.1.3. Licensing and Services

5.6.2. iBioLaunch Technology (iBio)
  5.6.2.1. Granted Patents
  5.6.2.2. Key Features
  5.6.2.3. Products
  5.6.2.4. Licensing and Services

5.7. Well-Known Cell-Free Expression Systems
5.7.1. Xpress CF Protein Synthesis Platform (Sutro Biopharma)
  5.7.1.1. Key Features
  5.7.1.2. Products
  5.7.1.3. Licensing and Services

5.7.2. TnT SP6 High-Yield Wheat Germ Protein Expression System (Promega Corporation)
  5.7.2.1. Key Features
  5.7.2.2. Products and Licensing

5.8. Other Expression Systems
5.8.1. LEXSY Protein Expression System (Jena Bioscience)
  5.8.1.1. Key Features
  5.8.1.2. Products
  5.8.1.3. Licensing and Services

5.8.2. C1 Expression System (Dyadic International)
  5.8.2.1. Granted Patents
  5.8.2.2. Key Features
  5.8.2.3. Products
  5.8.2.4. Licensing and Services

5.8.3. Cipex System (Cilian)
  5.8.3.1. Granted Patents
  5.8.3.2. Key Features
  5.8.3.3. Products
  5.8.3.4. Licensing and Services

6. Company Profiles
6.1. Chapter Overview
6.2. Agilent Technologies
  6.2.1. Overview
  6.2.2. Financial Performance
  6.2.3. Technology Platforms
    6.2.3.1. PathDetect Trans Reporting Systems
    6.2.3.2. PathDetect Cis-Reporting Systems
    6.2.3.3. LacSwitch II Inducible Mammalian Expression System
  6.2.4. Product Portfolio

6.3. Clontech
  6.3.1. Overview
  6.3.2. Financial Performance
  6.3.3. Technical Platforms
    6.3.3.1. HAT Protein Expression and Purification System
    6.3.3.2. pET Expression System
    6.3.3.3. Baculovirus Expression Systems (BacPAK Method)
  6.3.4. Product Portfolio

6.4. Geneva Biotech
  6.4.1. Technology Platforms
6.4.1.1. MultiBac™ Expression System
6.4.1.2. SweetBac™ Expression System
6.4.1.3. VLP Factory™
6.4.1.4. iBac™
6.4.1.5. ManuBac™
6.4.1.6. MultiBacMam™
6.4.1.7. MultiMam™ Transient
6.4.1.8. MultiMam™ Stable
6.4.1.9. Multicoli™
6.4.2. Product Portfolio
6.4.3. Licensing and Partnerships

6.5. Life Technologies / Thermo Fisher
6.5.1. Overview
6.5.2. Financial Performance
6.5.3. Technology Platforms
6.5.3.1. Geneart® Algae Expression and Engineering Kits
6.5.3.2. Scalable Transient Protein Expression Systems
6.5.3.3. Viral Gene Delivery for Protein Expression (Viral Power™)
6.5.3.4. Membrane Pro Expression Systems
6.5.3.5. T-REx Systems
6.5.3.6. Champion™ Pet Expression Systems
6.5.3.7. Bac-To-Bac® Baculovirus Expression System
6.5.3.8. Bac-To-Bac® HBM TOPO® Secreted Expression System
6.5.3.9. BaculoDirect™ Baculovirus Expression System
6.5.3.10. PichiaPink™ Yeast Expression Systems
6.5.3.11. Pichia Expression Systems
6.5.3.12. MembraneMax™ Protein Expression Kits
6.5.3.13. Meddes Drosophila Expression Systems
6.5.4. Product Portfolio
6.5.5. Licensing and Partnerships

6.6. Life Sensors
6.6.1. Overview
6.6.2. Technology Platforms
6.6.2.1. SUMO E.coli Expression Systems
6.6.2.2. SUMO Mammalian Expression Systems
6.6.2.3. SUMO Insect Expression Systems
6.6.2.4. SUMO Yeast Expression Systems
6.6.3. Product Portfolio
6.6.4. Licensing and Partnerships

6.7. Lonza
6.7.1. Overview
6.7.2. Financial Performance
6.7.3. Technology Platforms
6.7.3.1. GS Gene Expression System
6.7.3.2. GS Xceed Gene Expression System
6.7.3.3. XS E.coli Expression Systems
6.7.3.4. XS Pichia Expression Systems
6.7.3.5. XS Bacillus Expression Systems
6.7.4. Product Portfolio
6.7.5. Licensing and Partnerships

6.8. Merck Millipore
6.8.1. Overview
6.8.2. Financial Performance
6.8.3. Technology Platforms
6.8.3.1. Insect direct® System
6.8.3.2. UCOE Expression Technology
6.8.3.3. pET Expression System
6.8.4. Product Portfolio
6.8.5. Licensing and Partnerships
6.9. New England Biolabs
6.9.1. Overview
6.9.2. Technology Platforms
6.9.2.1. Gene Expression System
6.9.2.2. Yeast Protein Expression Kit
6.9.2.3. Cell-Free Expression Systems
6.9.3. Product Portfolio
6.9.4. Licensing and Partnerships

6.10. Oxford Expression Technologies
6.10.1. Overview
6.10.2. Technology Platforms
6.10.2.1. flashBAC Expression Systems
6.10.2.2. flashBAC Ultra Baculovirus Expression System
6.10.2.3. BacMam Expression Systems
6.10.3. Product Portfolio
6.10.4. Licensing and Partnerships

6.11. Pfenex (Dow Pharma)
6.11.1. Overview
6.11.2. Financial Performance
6.11.3. Technology Platforms
6.11.4. Product Portfolio
6.11.5. Licensing and Partnerships

6.12. Promega Corporation
6.12.1. Overview
6.12.2. Financial Performance
6.12.3. Technology Platforms
6.12.3.1. TNT® Quick Systems
6.12.3.2. TNT® T7 Insect Cell Extract Protein Expression System
6.12.3.3. TNT® SP6 High-Yield Protein Expression System
6.12.3.4. Regulated Mammalian Expression System
6.12.3.5. S30 T7 High-Yield Protein Expression System
6.12.4. Product Portfolio

6.13. Research Corporation Technology
6.13.1. Overview
6.13.2. Technology Platforms
6.13.2.1. Pichia Classic Protein Expression System
6.13.2.2. Pichia Glycoswitch Protein Expression System
6.13.2.3. Endotoxin-Free Clearcoli Expression System
6.13.3. Product Portfolio
6.13.4. Licensing and Partnerships

7. CMO Services
7.1. Chapter Overview
7.2. Biopharmaceutical CMOs: Regional Analysis
7.3. Biopharmaceutical CMOs: Analysis by Scale of Operation
7.4. Biopharmaceutical CMOs: Capability Analysis
7.4.1. Distribution by Type of Biologic Molecule
7.4.2. Distribution by Expression Systems
7.5. Biopharmaceutical CMOs: Type of Bioreactors
7.6. Roots Analysis Perspective

8. Opportunity Analysis
8.1. Chapter Overview
8.2. Marketed Biologics
8.3. Pipeline Biologics
8.3.1. Case-In-Point: Antibody Drug Conjugates
8.3.1.1. Development Pipeline
8.3.1.2. Pipeline Analysis
8.3.2. Case-In-Point: Bispecific Antibodies
8.3.2.1. Drugs Indicated for Oncological Diseases
8.3.2.2. Drugs Indicated for Non-Oncological Diseases
8.3.2.3. Drugs in Preclinical Trials
8.3.2.4. Pipeline Analysis
8.3.3. Case-In-Point: Subcutaneous Biologics
8.3.3.1. Pipeline Analysis
8.3.3.1.1. Distribution by Type of Molecule
8.3.3.1.2. Distribution by Phase of Development
8.3.3.1.3. Distribution by Indication
8.4. Biosimilars
8.4.1. Biosimilars: Distribution by Geography
8.4.2. Biosimilars: Distribution by Phase of Development
8.4.3. Biosimilars: Distribution by Product Category
8.5. Roots Analysis Perspective

9. SWOT Analysis
9.1. Overview
9.2. Strengths
9.3. Weaknesses
9.4. Opportunities
9.5. Threats

10. Interview Transcripts
10.1. Chapter Overview
10.2. Interview 1: Dr. Reinhard Breitling, Head of LEXSY Division, Jena Bioscience
10.3. Interview 2: Dr. Terence E Ryan, Senior Vice President and Chief Scientific Officer, iBio
10.4. Interview 3: Dr. Kurt R. Gehlsen, Vice President and Chief Scientific Officer, Research Corporation Technologies

11. Conclusion
11.1. Protein Expression: A Well Established Process for Producing Recombinant Proteins
11.2. Mammalian and Bacterial Systems are Widely Popular; New Systems are Gaining Attention
11.3. Biologics: A High Opportunity Market
11.4. Highly Promising Outlook for CMOs
11.5. Concluding Remarks

12. Appendix 1: Tabulated Data
13. Appendix 2: List of Companies and Organizations

List of Figures:

Figure 3.1 Protein Synthesis: An Overview
Figure 3.2 Recombinant Protein Expression Process
Figure 3.3 Types of Expression Systems
Figure 4.1 Expression Systems: Distribution by Type of Host
Figure 6.1 Agilent Technologies: Historical Sales (USD Billion), 2010-2014
Figure 6.2 Agilent Technologies: Sales by Business Segments (USD Billion), 2014
Figure 6.3 Takara Bio: Historical Sales (JPY Billion), 2010-2014
Figure 6.4 Takara Bio: Sales by Business Segments (JPY Billion), 2014
Figure 6.5 Thermofisher: Historical Sales (USD Billion), 2010-2014
Figure 6.6 Lonza: Historical Sales (CHF Billion), 2011-2014
Figure 6.7 Merck Millipore: Historical Sales (EUR Billion), 2010-2014
Figure 6.8 Pfenex: Historical Sales (USD Million), 2012-2014
Figure 6.9 Promega: Historical Sales (USD Million), 2008 - 2012
Figure 7.1 Biopharmaceutical CMOs: Geographical Locations
Figure 7.2 Biopharmaceutical CMOs: Distribution by Regions
Figure 7.3 Biopharmaceutical CMOs: Distribution by Scale of Operation
Figure 7.4 Biopharmaceutical CMOs: Distribution by Type of Biologic Molecule
Figure 7.5 Biopharmaceutical CMOs: Distribution by Expression Systems
Figure 7.6 Single Use Bioreactors: Advantages and Disadvantages
Figure 8.1 Approved Biologics: Distribution by Type of Host Cell
Figure 8.2 Pipeline Biologics: Distribution by Type of Molecule
List of Tables

Table 3.1 Comparison of Expression Systems
Table 4.1 List of Mammalian Expression Systems
Table 4.2 List of Bacterial Expression Systems
Table 4.3 List of Yeast Expression Systems
Table 4.4 List of Insect Expression Systems
Table 4.5 List of Plant Expression Systems
Table 4.6 List of Cell-Free Expression Systems
Table 4.7 List of Other Expression Systems
Table 4.8 List of Universities / Academia with Expression Systems
Table 5.1 PER.C6 Cell Line Technology: Product Portfolio
Table 5.2 Pfenex Technology: Product Portfolio
Table 5.3 Pfenex Technology: Partnerships/Deals (2012-2015)
Table 5.4 XS Expression Systems: Comparison
Table 5.5 Bac-to-Bac Baculovirus Expression System: Product Portfolio
Table 5.6 Drosophila Expression System: Product Portfolio
Table 5.7 Drosophila Expression System: Expressed Products
Table 5.8 BacPAK Protein Expression Kits
Table 5.9 flashBAC Expression Vector System: Expression Kits
Table 5.10 flashBAC Expression System: Licensing Deals (2012-2015)
Table 5.11 BryoTechnology: Product Portfolio
Table 5.12 iBioLaunch Technology: Product Portfolio
Table 5.13 iBioLaunch Technology: Partnerships/Deals (2012-2015)
Table 5.14 Xpress CF Protein Synthesis Platform: Product Portfolio
Table 5.15 Xpress CF Technology: Licensing Deals (2012-2015)
Table 5.16 LEXSY Expression Kits
Table 6.1 Agilent Technologies: Product Portfolio
Table 6.2 Clontech Laboratories: Products of Expression Systems
Table 6.3 Geneva Biotech: Product Portfolio
Table 6.4 Life Technologies: Product Portfolio
Table 6.5 Lifesensors: Product Portfolio
Table 6.6 Lonza: Product Portfolio
Table 6.7 Merck Millipore: Product Portfolio
Table 6.8 New England Biolabs: Product Portfolio
Table 6.9 Oxford Expression Technologies: Product Portfolio
Table 6.10 Oxford Expression Technologies: Partnerships
Table 6.12 Pfenex Technology: Product Portfolio
Table 6.13 Pfenex Technology: Partnerships (2012-2015)
Table 6.14 Promega Corporation: Product Portfolio
Table 6.15 Research Corporation Technology: Product Portfolio
Table 7.1 Biopharmaceutical CMOs: Scale of Operation
Table 7.2 Biopharmaceutical CMOs: Type of Biologics
Table 7.3 Biopharmaceutical CMOs: Type of Expression Systems
Table 7.4 Biopharmaceutical CMOs: Type of Bioreactor
Table 8.1 Marketed Biologics
Table 8.2 Antibody Drug Conjugates: Clinical Development Pipeline
Table 8.3 Antibody Drug Conjugates: Preclinical / Discovery Development Pipeline
Table 8.4 Bispecific Antibodies: Clinical Development Pipeline (Oncology)
Table 8.5 Bispecific Antibodies: Clinical Development Pipeline (Non-Oncology)
Table 8.6 Bispecific Antibodies: Preclinical / Discovery Development Pipeline
Table 8.7 Subcutaneous Biologics: Development Pipeline
Table 8.8 Biosimilars: Distribution by Geography
Table 8.9 Biosimilars: Distribution by Phase of Development
Table 8.10 Biosimilars: Distribution by Product Category
Table 8.11 Pipeline Biologics: Distribution by Type of Molecule
Table 8.7 Biosimilars: Development Pipeline
Table 9.1 SWOT Analysis
Table 9.2 Protein Expression Systems for Co-Expression
Table 12.1 Expression Systems: Distribution by Type of Host
Table 12.2 Agilent Technologies: Historical Sales (USD Billion), 2010-2014
Table 12.3 Agilent Technologies: Sales of Business Segments (USD Billion), 2014
Table 12.4 Takara Bio: Historical Sales (JPY Billion), 2010-2014
Table 12.5 Takara Bio: Sales of Business Segments (JPY Billion), 2014
Table 12.6 Thermo Fisher: Historical Sales (USD Billion), 2010-2014
Table 12.7 Lonza: Historical Sales (CHF Billion), 2011-2014
Table 12.8 Merck Millipore: Historical Sales (EUR Billion), 2010-2014
Table 12.9 Pfenex: Historical Sales (USD Million), 2012-2014
Table 12.10 Promega: Historical Sales (USD Million), 2008-2012
Table 12.11 Approved Biologics: Distribution by Type of Host Cell
Table 12.12 Pipeline Biologics: Distribution by Type of Molecule
Table 12.13 ADCs Pipeline: Distribution by Phase of Development
Table 12.14 Bispecific Antibodies Pipeline: Distribution by Phase of Development
Table 12.15 Subcutaneous Biologics Pipeline: Distribution by Type of Molecule
Table 12.16 Subcutaneous Biologics Pipeline: Distribution by Phase of Development
Table 12.17 Subcutaneous Biologics Pipeline: Leading Indications / Therapeutic Areas
Table 12.18 Biosimilars: Distribution by Phase of Development

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