Cell Therapy
To Gordon and Sally and to friends and colleagues whose lives have been touched by cancer.
Preface

The use of cell-based therapies is currently undergoing a rebirth, based upon the extraordinary ability of pluripotent stem cells to differentiate into every other type of cell. This opens up almost unlimited applications in tissue regeneration and repair. It is important to remember, however, that cellular therapies have a relatively long history, peppered with promises, some successes, and many disappointments. Over the years the interest has, as a result, waxed and waned, but there has been undoubted forward momentum, which has brought us to this important point. This progress has been made possible by work in many disciplines, including immunology, cell and molecular biology, hematology, and clinical medicine. A somewhat overlooked, but critical area has been the work of the cell processing or manufacturing technologists and researchers. These individuals are the true translational scientists. They have bridged that often quoted gulf between “bench and bedside.” This was, and continues to be, pioneering work, since it required development of many of the tools and techniques that today we take for granted. Many of us have memories of times when the field seemed more like alchemy than science! It has been exciting and rewarding to see it grow and mature and to have the opportunity to work with and learn from colleagues with so many different perspectives. All of us have benefited from the experience of biologists and engineers, blood bankers and physicians, and even regulators and lawyers. If we are to succeed in this next important phase, that kind of interaction must be continued and strengthened.

An important change is occurring in the way we work. The area is now sufficiently mature that it is no longer acceptable to operate as an outgrowth of an academic research laboratory. We are now a stand-alone discipline with both expertise and responsibilities. This transition has occurred relatively rapidly and was necessitated by developments both in science and in regulation. We have the obligation to make possible these new therapies in the context of offering the recipient a safe and hopefully effective product.

There have been few resources to call upon to help us, apart from the support network that has grown between facilities and individuals. Initially this took the form of reassuring each other that we were operating in similar ways, now we need to build upon this foundation.

This book is an attempt to provide a written guide to how academic cell therapy product manufacturing facilities (usually referred to as Good Manufacturing
Practice (GMP) facilities) operate. The aim is to share the common experience of individuals who have worked in the field. It has its origins in the contract facilities of the original Production Assistance for Cellular Therapies (PACT) group – at Universities of Minnesota and Pittsburgh and Baylor College of Medicine. These centers worked under a contract from the U.S. National Heart, Lung, and Blood Institute (NHLBI) to provide cell product manufacturing services to clinical centers around the country. The contract also included administrative and coordinating services provided by the EMMES Corporation in Maryland. For this endeavor to succeed it was important to develop close communication between the centers, not only in relation to providing products, but also to achieve the additional goal of educational outreach to the community as a whole. These interactions resulted in collaborative studies, training courses, and webinars, and stimulated the development of this book. Through ongoing discussions, within and beyond PACT, it became clear that there were many common issues, questions, and concerns relating to operating an academic GMP facility. These ranged from what was the best design, how should they be cleaned and monitored, and what are the relevant regulations, to how do you train staff, order materials, and release products? While there is tremendous diversity in types of products, and where and how they are manufactured, we felt that it would be useful to catalog our experience within the PACT centers and to draw upon the expertise of colleagues to put together this book. Our hope is that it will be useful at many levels—both for those starting out and for those who are changing the way they currently operate. It should certainly not be viewed as the correct or only way of addressing a subject, but more as the collective wisdom of a small group who have wrestled with the problem!

In closing, I think it is important to remember the extraordinary courage and fortitude of the patients who consent to these still experimental therapies. We all owe them a debt of gratitude that we hope to repay by developing this field to its fullest potential.

Houston, Texas

Adrian Gee
Acknowledgments

Special thanks are due to the following:

- The staff and technologists at the PACT centers for their hard work and contributions.
- Debbie Wood at The EMMES Corporation for her fortitude in dealing with the manuscripts.
- The National Heart, Lung, and Blood Institute for their support to the cell processing community.
# Contents

## Part I  Regulatory

1  Regulation of Cell Product Manufacturing and Delivery: A United States Perspective  
   R.W. Lindblad  
   3

2  The Regulatory Situation for Academic Cell Therapy Facilities in Europe  
   I. Slaper-Cortenbach, M. Scott, D. Herrmann, M. Introna, K. Theunissen, P. Theocharous, and C. Chabannon  
   27

3  A Regulatory System for Cell and Tissue Therapies: Proposed Approach in Australia  
   A. Farrugia  
   37

## Part II  GMP Facility Design

4  University of Minnesota – Molecular and Cellular Therapeutics (MCT)  
   D.H. McKenna, Jr.  
   51

5  University of Pittsburgh Cancer Institute – Hematopoietic Stem Cell Laboratory (HSC Lab)/Immunological Monitoring and Cellular Products Laboratory (IMCPL)  
   D.L. Griffin, A.D. Donnenberg, and T.L. Whiteside  
   57

6  Baylor College of Medicine – Center for Cell and Gene Therapy (CAGT)  
   A. Gee  
   67

7  Design of a New GMP Facility – Lessons Learned  
   A. Gee  
   79
# Part III  Professional Cell Therapy Standards

8  **AABB Cell Therapy Standards**  ........................................ 87  
    Z.M. Szczepiorkowski and E. Nunes

9  **Professional Standards for Cellular Therapies: Foundation for the Accreditation of Cellular Therapy (FACT)**  . 97  
    P.I. Warkentin

# Part IV  Facility Operations

10  **Standard Operating Procedures**  ........................................ 109  
    C.G. Lindgren

11  **Staffing, Training, and Competency**  .................................. 121  
    D.M. Kadidlo

12  **Cleaning Procedures**  .................................................... 135  
    A. Gee and D.L. Lyon

13  **Environmental Monitoring**  ............................................. 145  
    A. Gee and D.L. Lyon

14  **Supply Management**  ..................................................... 157  
    A. Gee and C.M. Rooney

15  **Facility Equipment**  .................................................. 171  
    D.L. Griffin

16  **Quality**  ................................................................. 187  
    J.W. Atkins

17  **Product Manufacturing**  ............................................... 199  
    A. Gee

18  **Product Review, Release, and Administration**  .................... 215  
    N.H. Collins

19  **Use of a Facility Master File to Facilitate Regulatory Submissions for Cell Therapy Products**  .................... 229  
    E.J. Read and H.M. Khuu

**Appendix A**  ................................................................. 237

**Appendix B**  ................................................................. 239

**Appendix C**  ................................................................. 241

**Appendix D**  ................................................................. 243

**Appendix E**  ................................................................. 245

**Index**  ................................................................. 247
Contributors

**J. Wade Atkins, MS, MT (ASCP), SBB** Department of Transfusion Medicine, National Institutes of Health Clinical Center, Bethesda, MD 20892-1184, USA, jatkins@mail.cc.nih.gov

**Christian Chabannon, MD, PhD** Members of the European Legal and Regulatory Affairs (LRA) Committee of the International Society for Cellular Therapy (ISCT), Vancouver, BC, Canada V5Y 1J6, chabannonc@marseille.fnclcc.fr

**Nancy H. Collins, PhD** Department of Medical Microbiology and Immunology, University of Toledo Health Science Campus, Toledo, OH 43614-2598, USA, nancy.collins@utoledo.edu

**Albert D. Donnenberg, PhD** Hematopoietic Stem Cell Laboratory, University of Pittsburgh Cancer Institute, Pittsburgh, PA 15213, USA, donnenbergad@upmc.edu

**Albert Farrugia, BSc, PhD** Plasma Protein Therapeutics Association, Annapolis, MD 21401, USA; School of Surgery and Pathology, Dentistry and Health Sciences, University of Western Australia, Woden, ACT, Australia, afarrugia@pptaglobal.org

**Adrian Gee, MI Biol, PhD** Baylor College of Medicine, Center for Cell and Gene Therapy, Houston, TX 77030, USA, apgee@txccc.org

**Deborah L. Griffin, MS** Immunologic Monitoring and Cellular Therapy Products Laboratory, Hematopoietic Stem Cell Laboratory, University of Pittsburgh Cancer Institute, Pittsburgh, PA 15213, USA, griffindl@upmc.edu

**Doris Herrmann, PhD** Members of the European Legal and Regulatory Affairs (LRA) Committee of the International Society for Cellular Therapy (ISCT), Vancouver, BC, Canada V5Y 1J6, doris.herrmann@cytonet.de

**Martino Introna, MD** Members of the European Legal and Regulatory Affairs (LRA) Committee of the International Society for Cellular Therapy (ISCT), Vancouver, BC, Canada V5Y 1J6, mintrona@ospedaliriuniti.bergamo.it
Diane M. Kadidlo, MT (ASCP), SBB  Molecular and Cellular Therapeutics Facility, University of Minnesota, St. Paul, MN 55108, USA, kadid003@umn.edu

Hanh M. Khuu, MD  Cell Processing Section, Department of Transfusion Medicine, NIH Clinical Center, National Institutes of Health, Bethesda, MD 20892, USA, hkuu@mail.nih.gov

Robert W. Lindblad, MD, FACEP  PACT Group, The EMMES Corporation, Rockville, MD 20850, USA, rlindblad@emmes.com

Catherine G. Lindgren, BSc  University of Washington/Fred Hutchinson Cancer Research Center, University of Washington Medical Center, Seattle, WA 98195, USA, lindgren@u.washington.edu

Deborah L. Lyon, MT (ASCP), CLSp (MB)  Baylor College of Medicine, Center for Cell and Gene Therapy, Houston, TX 77030, USA, dlyon@txccc.org

David H. McKenna, Jr., MD  Molecular and Cellular Therapeutics Facility, Fairview–University Medical Center, University of Minnesota, St, Paul, MN 55108, USA, mcken020@umn.edu

Eduardo Nunes, AABB, Bethesda, MD 20814, USA, eduardo@aabb.org

Elizabeth J. Read, MD  Blood Systems Research Institute, University of California, San Francisco, CA 94118, USA, eread@bloodsystems.org

Cliona Rooney, PhD  Baylor College of Medicine, Center for Cell and Gene Therapy, Houston, TX 77030, USA, cmrooney@txccc.org

Mike A. Scott, PhD, FRCPath  Members of the European Legal and Regulatory Affairs (LRA) Committee of the International Society for Cellular Therapy (ISCT), Vancouver, BC, Canada V5Y 1J6, mas59@cam.ac.uk

Ineke Slaper-Cortenbach, PhD  Department of Immunology, UMC Utrecht, The Utrecht Center for Gene and Cell Therapy, GA Utrecht 3508, The Netherlands, i.slaper@umcutrecht.nl

Zbigniew M. Szczepiorkowski, MD, PhD, FCAP  Dartmouth-Hitchcock Medical Center, Lebanon, NH 03756, USA, zbigniew.m.szczepiorkowski@hitchcock.org

Panteli Theocharous, BSc (Hon), MSc, PhD  Members of the European Legal and Regulatory Affairs (LRA) Committee of the International Society for Cellular Therapy (ISCT), Vancouver, BC, Canada V5Y 1J6, ptheocha@its.jnj.com

Koen Theunissen, MD  Members of the European Legal and Regulatory Affairs (LRA) Committee of the International Society for Cellular Therapy (ISCT), Vancouver, BC, Canada V5Y 1J6, koen.theunissen@uz.kuleuven.ac.be
Phyllis I. Warkentin, MD  University of Nebraska Medical Center, Nebraska Medical Center, Omaha, NE 98198-2168, USA, pwarkent@unmc.edu

Theresa L. Whiteside, PhD  Immunologic Monitoring and Cellular Therapy Products Laboratory, University of Pittsburgh Cancer Institute, Pittsburgh, PA 15213, USA, whitesidetl@upmc.edu
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
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<td>AABB</td>
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<td>ABM</td>
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<td>COA, CoA, C of A</td>
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<td>HVAC</td>
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<td>IgM</td>
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<td>IND</td>
<td>Investigational New Drug</td>
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<td>Installation Qualification</td>
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<td>NK</td>
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