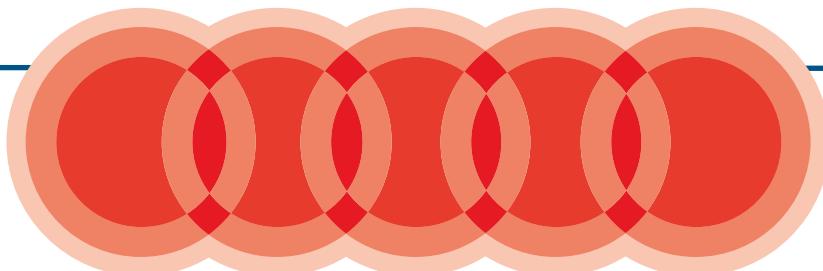


ENVIRONMENTAL MONITORING

A COMPREHENSIVE HANDBOOK

VOLUME 5



Jeanne Moldenhauer
Editor

CONTENTS

Preface

I ENVIRONMENTAL MONITORING OF MICROBIOLOGY LABORATORIES

Frank Settineri

Introduction

Training

Laboratory Design and Flow

 Sample receipt area

 Sample staging and holding area

 Biohazard waste area

 Media preparation areas

 General testing area

 Live organism area (for identification, growth promotion,
 and culture preparation)

 Cleanroom areas (suites or isolators) for sterility
 testing

Documentation

Standard Operating Procedures (SOPs)

Protocols

- Reporting of data
 - Sample number
 - Raw data form
 - Specifications
- Equipment, Utensils, Instruments, and Work Surfaces
- Alert/Action Levels
- Nonviable Particles
- Contract Laboratories
- Summary
- References
- About the Author

2 DATA MANAGEMENT — SMALL SIZE OPTIONS

Jeanne Moldenhauer

- Introduction
- Manual Data Management Systems
 - The define phase
 - The measurement phase
 - The analysis phase
 - The improvement phase
 - The control phase
- Spreadsheets and Simple Databases
- Manual Systems
- Commercial Systems
- Conclusion
- References
- About the Author

3 MAKING SENSE OF ENVIRONMENTAL MONITORING TRENDING DATA

Dawn McIver

- Tracking vs. Trending
- Useful Calculations
- Monthly/Quarterly Results
- Generating a Template
- Drawing a Conclusion
- References
- About the Author

4 PRESENTING ENVIRONMENTAL MONITORING DATA TO INTERNAL AND EXTERNAL STAKEHOLDERS

Kim Van Antwerpen

- The Case for Trending Environmental Monitoring Data
- Presenting EM Data to Internal Stakeholders
- Presenting EM Data to External Stakeholders

Types of EM Data Presented

- Hits
- Alerts
- Actions
- Mold

Contents of the Environmental Monitoring Trending Presentation

- Viable EM Data
- Personnel
- Non-viable by grade
- Water
- Statistical trending of hits, alerts, actions, and molds
- Maps

Other Data Presented at an Environmental Review Board Meeting

Case Studies

- Case Study #1: Observation of mold in a classified area
- Case Study #2: "Objectionable organisms" in a compounding room
- Case Study #3: EM trends in a gowning area

Benefits of a Trending Program to Both Company and Customer

Conclusion

References

About the Author

5 MALDI-TOF METHOD FOR IDENTIFICATION OF MICROBIAL ISOLATES*David Shelef*

Technology Background

Benefits of the MALDI-TOF Method

Challenges in Using the MALDI-TOF Method for Environmental Monitoring

Conclusions

References

About the Author

6 MICROBIAL IDENTIFICATION LABORATORY IN SUPPORT OF AN ENVIRONMENTAL MONITORING PROGRAM*Mary J. Griffin*

Introduction

Pharmaceutical Quality Control Microbiology Laboratory

Microbial Identification Laboratory — Design and Layout

Elements of the Microbial Identification Program

- EM growth media

- Sampling

- Incubation

- Reading environmental monitoring plates

- Communication

Microbial Identification Systems and Methods

- Primary methods

- Microbial identification system on the horizon
- Contract Laboratories
- Development of an Efficient Microbial Identification Process Flow
- Process Flow Benefits and Consideration
- Isolated Microorganism Impact and Risk
- Investigations and EM Microbial Identifications
- Microbial Identification Laboratory — Training
- Lean Laboratory Design Considerations
- Disinfection Program Support — Surface Monitoring Data
- Microbial Identification Laboratory — Data Trending
- Application of Novel and Rapid Alternative Methods
- Environmental Review Council/Committee (ERC)
- Conclusion
- References
- About the Author

7 ENVIRONMENTAL MONITORING AND THE MICROBIAL CONTROL STRATEGY

Karen Ginsbury

- References
- About the Author

8 FUNGAL CONTAMINATION AND DISINFECTION

Jim Polarine and Dan Klein

- Introduction
- Fungi Overview
- Testing Fungi
- Disinfection
- Conclusion
- References
- About the Author

9 EMERGING TECHNOLOGY FOR FUNGAL CONTAMINATION CONTROL

Vladimir Podlipskiy, Sergei Bibikov, Brian Hubka and Daniel Kesonen

- Introduction
- Fungal Contamination in Pharmaceutical Environments
- Other Concerns with Fungi
 - Mycotoxins
 - Types of mycotoxins
 - CDC authorized review
- Fungi Growth Factors
- Fungi Contamination Control
- Environmental Control
- Physical Methods of Control

Control by Antimicrobial Products
Novel Natural Approach to Contamination Control
MMD Product Testing
MMD — Potential Applications
 Why use Mold & Mildew Doctor?
References
About the Authors

10 MONITORING OF AIR IN CLEAN ENVIRONMENTS — A COMPARATIVE STUDY WITH INSTANTANEOUS MICROBIAL DETECTION

Bengt Ljungqvist and Berit Reinmüller

Introduction
Materials and Methods
 Monitoring equipment
 Test conditions
Results
Discussion
Conclusions
References
About the Authors

11 DEVELOPMENT AND IMPLEMENTATION OF A PROGRAM FOR ENVIRONMENTAL MONITORING IN THE COMPOUNDING PHARMACY

Jeanne Moldenhauer

Introduction
Requirements of USP <797> for Environmental Monitoring Programs
 Low risk compounding operations
 Medium risk compounding operations
 High risk compounding operations
 Environmental monitoring
Inspectional Expectations
Components of an Environmental Control Program
 The facility design
 Maintenance of the facility
 The documentation generated, completed and archived
 Methods used for cleaning, sanitization or disinfection
 Established process controls
 Housekeeping practices used
 Control of area access
 Training of analysts
 Quality assurance processes
Establishing an Environmental Monitoring Program
 Determination of sampling methods
 Determination of where to sample — selecting sampling sites

Determination of a sampling frequency
setting of limits for your environmental control program
Analytical method variability
Data management
Data interpretation
Characterization (identification) of environmental isolates
Dealing with adverse trends
Monitoring During Media Fills
Conclusion
References
About the Author

12 DESIGNING A CONTAMINATION PROGRAM FOR BIOTECH OPERATIONS

Jeanne Moldenhauer

Production of Proteins for Therapeutic Use from Cell Cultures
Contamination in Biotechnology Processes
What are the Potential Sources of Contamination and how can they be Avoided?
Raw materials and ingredients
Cell cultures and culture processes
The manufacturing process and equipment
Equipment inlets and outlets
Utility systems
Personnel — operators, analysts, sampling technicians
Types of Biotechnology Manufacturing Processes
Open systems
Closed systems
Regulatory Guidance for Active Pharmaceutical Ingredients
Contamination Control
ICH Q7A: GMPs for active pharmaceutical ingredients
Contamination Control for Open Systems
Contamination Control for Closed Systems
Conclusion
References
About the Author

Appendix
Index