Verification and/or Validation of Decontaminations
What Do We Need to Look for?

Bern, 23.08.2019
Overview

- Background
  - Who am I?
  - Definitions
  - PQ vs. validation

- Room and HEPA Filter Fumigations
  - Definition of fumigation zone
  - How to check your fumigation
  - What is a good BI?

- Autoclaving
  - Definition of loads
  - How to check your autoclave run

- Summary
Background

Who am I?
- M. Sc. in Biotechnology (ESBS) – master’s thesis at AAHL
- PhD in Molecular Biology / Virology (Develogen AG / Humboldt Universität zu Berlin)
- Post-Doc (Veterinary Hospital University of Bern)
- Head of Biosafety LABOR SPIEZ (BSL3/4)
- Biosafety & Engineering IVI (BSL3/BSL3ag/BSL4)
- Biosafety Consultant (B&H)
Definitions

Verification

confirmation, through the provision of objective evidence that specified requirements have been fulfilled (adapted from ISO 9000:2005)

Validation

confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled (adapted from ISO 9000:2005)

Taken from CWA 15793:2008
Definitions

For the sake of this presentation …

- Verification
  - Periodically confirming the results of a previous validation

- Validation
  - Confirmation of a pre-defined process result for a specific intended use or application in three or more consecutive runs
PQ vs. Validation

---

13th Applied Biosafety Meeting – SBNet | 22./23.08.2019 | KUM
Room and HEPA Filter Fumigations
Room and HEPA Filter Fumigations

Definition of the fumigation zone
Room and HEPA Filter Fumigations

Definition of the fumigation zone

- Supply HEPA filters
- Air-tight dampers (supply)
- Room
- Air-tight dampers (exhaust)
- Exhaust HEPA filters
- Others?

=> All in one or separate fumigations?
Room and HEPA Filter Fumigations

How to check your fumigation

- Biological indicators
- Chemical indicators
- Physical parameters (conc., temp, rH)
Room and HEPA Filter Fumigations

How to check your fumigation

- Biological indicators
  - Generally spores of *G. stearothermophilus* (ATCC 12980 or 7953), sometimes *B. atrophaeus* (ATCC 9372)
  - Plated onto stainless steel discs, packaged in Tyvek
  - Usually 10E6 spores – necessary?
  - How many BIs per fumigation zone?

110 BIs

15 BIs

=> Most important parameter showing effect of fumigant across fumigation zone!
Room and HEPA Filter Fumigations

How to check your fumigation

- Chemical indicators
  - Chemical reaction showing exposure to fumigant
  - Usually placed together with BI
  - Correlation with BI?

=> Indication of fumigant distribution within fumigation zone!
How to check your fumigation

- Physical parameters (conc., temp, rH)
  - Use data loggers!!!
  - Conc.: electro-chemical sensors; +/- 20% accuracy
  - rH: input and distribution of fumigant
  - Temp.: heat input (room pressure!)

=> Comparison of different runs within same fumigation zone!
=> Indication of potential problems during fumigation.
# Room and HEPA Filter Fumigations

## What is a good BI?

<table>
<thead>
<tr>
<th>Step</th>
<th>Duration</th>
<th>Flow</th>
<th>rel. hum.</th>
<th>Injection rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dehumidification</td>
<td>20 min</td>
<td>34 m3/h</td>
<td>10 mg/l</td>
<td>-</td>
</tr>
<tr>
<td>Conditioning</td>
<td>15 min</td>
<td>32 m3/h</td>
<td>-</td>
<td>10 g/min</td>
</tr>
<tr>
<td>Decontamination</td>
<td>150 min</td>
<td>32 m3/h</td>
<td>-</td>
<td>9.5 g/min</td>
</tr>
<tr>
<td>Aeration</td>
<td>60 min</td>
<td>34 m3/h</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- **Bacterial spore indicators**
  - Total volume $\text{H}_2\text{O}_2$: **1575 ml**

<table>
<thead>
<tr>
<th>Step</th>
<th>Duration</th>
<th>Flow</th>
<th>rel. hum.</th>
<th>Injection rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dehumidification</td>
<td>20 min</td>
<td>34 m3/h</td>
<td>10 mg/l</td>
<td>-</td>
</tr>
<tr>
<td>Conditioning</td>
<td>30 min</td>
<td>32 m3/h</td>
<td>-</td>
<td>12 g/min</td>
</tr>
<tr>
<td>Decontamination</td>
<td>300 min</td>
<td>32 m3/h</td>
<td>-</td>
<td>11 g/min</td>
</tr>
<tr>
<td>Aeration</td>
<td>60 min</td>
<td>34 m3/h</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- **FMDV**
  - Total volume $\text{H}_2\text{O}_2$: **3660 ml**
Autoclaving
Definition of loads

- Sterilisation vs. waste inactivation
- Liquids vs. solids
- Waste containers
- Worst case scenarios / load definitions
- Where to obtain material for validation?
- Process controls (internal vs. external)
Autoclaving

Definition of loads
Autoclaving

Process controls
Autoclaving

How to check your autoclave run

- Biological indicators
- Chemical indicators
- Physical parameters
**Autoclaving**

---

**How to check your autoclave run**

- Biological indicators (EN 866)
  - Spores of *G. stearothermophilus*
  - On filter paper vs. in liquid
  - Usually 10E6 spores – needed?
  - Disadvantage: incubator needed

=> Most important parameter showing effect of steam penetration!
Autoclaving

How to check your autoclave run

- Chemical indicators (EN 867)
  - Results directly after the process
  - For 121°C and 134°C
  - Cheap and easy
  - Treatment control / endpoint control
  - Disadvantage: only limited temperature and time details
Autoclaving

How to check your autoclave run

- Physical parameters
  - wireless data loggers
  - can tolerate temperatures from -80 °C to +150 °C
  - can operate under extreme conditions
  - results available either directly after run or even during (transmitter)
  - disadvantage: need of a computer, expensive
Summary

- Validation
  - Required for all containment relevant processes
  - Required during commissioning and following relevant changes to the equipment or the process
  - Documentation of results as well as plan for future verifications (periodical verification, controls for individual runs)

- Verification
  - Validation results need to be verified periodically (risk-assessment)

- Process controls
  - Need to be defined following analysis of validation results
  - Risk-based

Personal recommendations
Thank you!
Basler & Hofmann Zürich
Literature Overview


Kümin D., Gsell Albert M. and Summermatter K., Comparison and Validation of Three Fumigation Methods to Inactivate Foot-and-Mouth Disease Virus, Applied Biosafety, 2018, 23: 70-76.
