

Sterile Barrier Integrity Task Group Update

- For Presentation to:
• The IoPP Medical Device Packaging Committee
- November 9, 2004

11/09/04

Sterile Barrier Integrity Task Group Update



Agenda

- Members and Technical Help
- Charter Statement and Objectives
- Progress
- Experiment 1
 - Accomplishments
 - Results
 - Next Steps
- Future Experiments

11/09/04

Sterile Barrier Integrity Task Group Update



Subcommittee Members

- Brett Baker- Sabin Corporation
- Laura Bix- MSU
- Steve Bunnell- Mocon
- Steve Good- Abbott
- Ron Iwazskiewicz- MSU
- Varsha Kalynakar- Cardinal Health
- Hugh Lockhart- MSU
- Bob Maxiner
- Jordan Montgomery- Medtronic
- Tom Misik- Belco Packaging Systems
- Dave Morris- iTi Qualitek
- Mitch Neely- Cardinal Health
- Jane Severin- MSU
- George Young- GWY Technologies

11/09/04

Sterile Barrier Integrity Task Group Update



Technical Assistance

- Gary Burgess- Engineering Mechanics, MSU
- Tom Corner- Microbiologist, Microbiology and Molecular Genetics, MSU
- Nick Fotis- Director, Packaging Technology Center Cardinal Health
- Dennis Gilliland- Statistician, Department of Statistics and Probability, MSU
- Earl Hackett Jr.-
- Bruce Harte- Food Science and Human Nutrition, MSU
- John Linz- Microbiologist, Food Science and Human Nutrition, MSU
- Mike Rich- Composite Center, MSU
- Paul Singh- Agricultural Engineering, MSU

11/09/04

Sterile Barrier Integrity Task Group Update



Student Workers

- Kristi Radakovic
- Becki Schaeff

11/09/04

Sterile Barrier Integrity Task Group Update



Charter Statement

We are attempting to answer the question, "What hole size presents a danger in medical device packages"? So that:

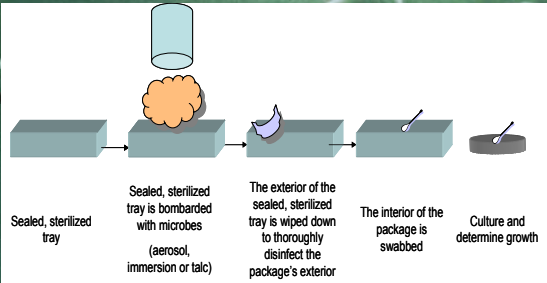
- Manufacturers can make informed decisions about the appropriate sensitivity for integrity tests
- Informed decisions can be made in the event of a potential recall situation
- Patient safety is maximized, while costs are minimized

11/09/04

Sterile Barrier Integrity Task Group Update



Background

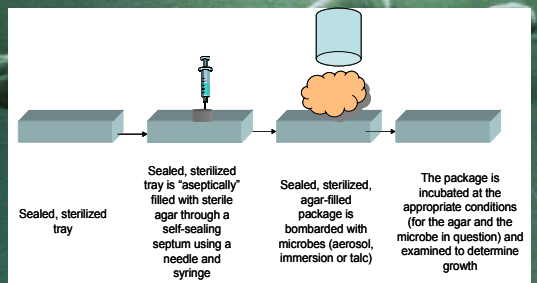


11/09/04

Sterile Barrier Integrity Task Group Update

MICHIGAN STATE UNIVERSITY

Background



11/09/04

Sterile Barrier Integrity Task Group Update

MICHIGAN STATE UNIVERSITY

Experiment 1- Working Hypotheses

1. "Aseptic" introduction of appropriate agar growth medium into a sterile package will not result in unwanted contamination of the package (false positives).
2. "Aseptic" introduction of appropriate agar growth medium into a sterile package will result in the ability to measure package integrity after packages have been subjected to a microbial challenge

11/09/04

Sterile Barrier Integrity Task Group Update

MICHIGAN STATE UNIVERSITY

Progress

11/09/04

Sterile Barrier Integrity Task Group Update

MICHIGAN STATE UNIVERSITY

Trays & Lids

- Tray
 - Perfecseal Outer Tray (PN350215-001)
 - PETG
- Lid
 - Amcor Flexibles PTH-017 Heat Seal Coated 1073B Tyvek
- Heat sealer - SenCorp MD 2420



11/09/04

Sterile Barrier Integrity Task Group Update

MICHIGAN STATE UNIVERSITY



Trays & Lids

- Septum Options
 - Electrical Tape w/ Silicone
 - Duct Tape w/ Silicone
 - Silicone Only
 - Sticky Nickel
- Puncture Location

	A	B	C	D	E	F	G	H	I	J	
1											1
2											2
3											3
4											4
5											5
6											6
7											7
8											8
9											9
10											10
11											11
12											12
	A	B	C	D	E	F	G	H	I	J	

11/09/04

Sterile Barrier Integrity Task
Group Update



Trays & Lids

- Agar Flow
 - 16 Gauge needle
 - Faster flow of agar into syringe
 - 18 Gauge needle
 - Minimize hole in SN when injecting into tray
 - Syringe used once to inoculate 2 trays
 - 25 ml into each tray



11/09/04

Sterile Barrier Integrity Task
Group Update



Microbiology Methods

- Autoclaving and Sterilization Techniques
- Agar Preparation
- Growth Media Prep
- Growth Quantification Techniques
- Pipetting



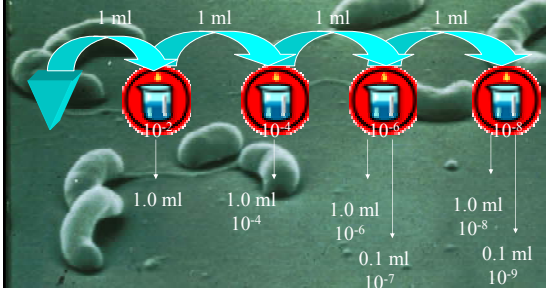
11/09/04

Sterile Barrier Integrity Task
Group Update



Microbiology Methods

- Dilution Techniques



11/09/04

Sterile Barrier Integrity Task
Group Update



Microbiology Methods

- Determination of initial microbial concentration



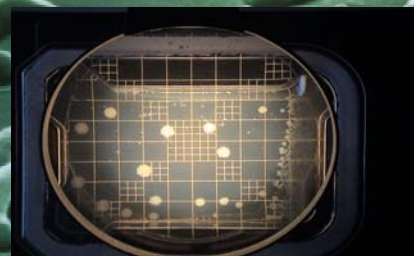
11/09/04

Sterile Barrier Integrity Task
Group Update



Microbiology Methods

- Plate/Colony Counting



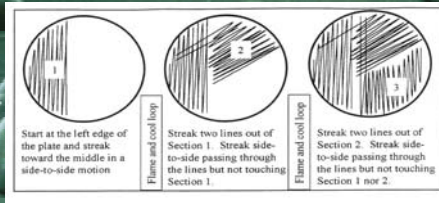
11/09/04

Sterile Barrier Integrity Task
Group Update



Microbiological Methods

• Plating Techniques



11/09/04

Sterile Barrier Integrity Task
Group Update



Current Study

Experiment 1

11/09/04

Sterile Barrier Integrity Task
Group Update



Experiment 1- Working Hypotheses

1. "Aseptic" introduction of appropriate agar growth medium into a sterile package will not result in unwanted contamination of the package (false positives).
2. "Aseptic" introduction of appropriate agar growth medium into a sterile package will result in the ability to measure package integrity after packages have been subjected to a microbial challenge

11/09/04

Sterile Barrier Integrity Task
Group Update



Study Materials

- Sealed trays sterilized by Cardinal Healthcare
- Sticky Nickel Septum provided by Mocon
- Bacteria used: *Escherichia coli* K-12, ATCC Number 29181 (provided by Medtronic).
 - 5 Concentrations of E.coli K-12
 - 0, 10^2 , 10^4 , 10^6 , 10^8

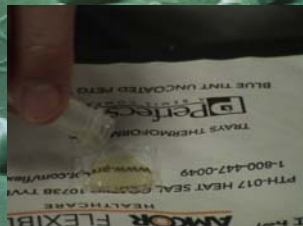
11/09/04

Sterile Barrier Integrity Task
Group Update



4 Test Groups

- Test Group 1
 - Inject Through Contaminated Area



11/09/04

Sterile Barrier Integrity Task
Group Update



4 Test Groups

- Test Group 2
 - Inject Through Contaminated Area (with Alcohol Swab)



11/09/04

Sterile Barrier Integrity Task
Group Update



4 Test Groups

- Test Group 3
 - Inject Through Non-Contaminated Area (with Alcohol Swab)



11/09/04

Sterile Barrier Integrity Task
Group Update



4 Test Groups

- Test Group 4
 - Positive Control



11/09/04

Sterile Barrier Integrity Task
Group Update



Results

- Test Group 1- Inject Through Contaminated Area (No Alcohol Swab)
 - 10 per concentration (50 total)
 - 0 concentration- No growth
 - 10²- No growth
 - 10⁴- No growth
 - 10⁶- 1 showed growth
 - 10⁸- 2 showed growth

11/09/04

Sterile Barrier Integrity Task
Group Update



Results, Continued

- Test Group 2- Inject Through Contaminated Area (Using Alcohol Swab)
 - Pending

11/09/04

Sterile Barrier Integrity Task
Group Update



Results, Continued

- Test Group 3- Inject Through Non-Contaminated Area
 - 30 trays total
 - 27 No Growth
 - 3 Unknown Particulate

11/09/04

Sterile Barrier Integrity Task
Group Update



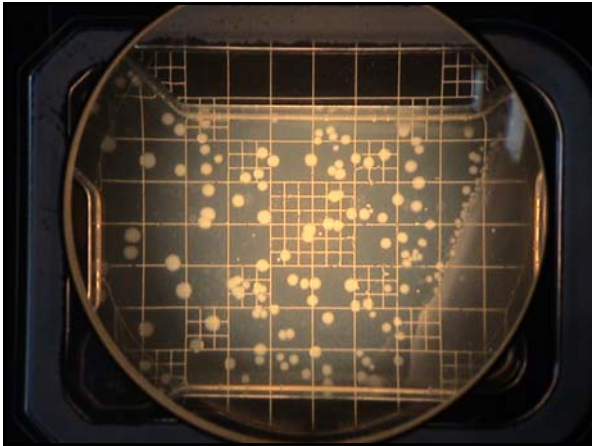
Results, Continued

- Test Group 4- Positive Control
 - 10 trays per concentration (50 trays total)
 - 0 Concentration
 - 9 No growth
 - 1 outlier fungus
 - 10²- No growth
 - 10⁴- 1 showed growth
 - 10⁶- 2 showed growth
 - 10⁸- 6 showed growth

11/09/04

Sterile Barrier Integrity Task
Group Update





Accomplishments

- Defined Study Methodology
- Navigated much of the Microbiology Learning Curve Successfully
- Completed two Pilot Studies
- Successfully found and Connected with Collaborators from a Variety of Disciplines

11/09/04

Sterile Barrier Integrity Task
Group Update



Next Steps

- Refine Microbiology Techniques
 - Agar handling
 - UV
 - Sticky Nickel handling
 - Evaluation of Use of Marker Microbes
- Complete Experiment 1
- If the working hypotheses are true, the method will be presented to ASTM F-02 for consideration as a standard.
- Obtain Funding for future experiments
- Standard will be used in future studies
 - Experiments 2 & 3

11/09/04

Sterile Barrier Integrity Task
Group Update



Future Studies

11/09/04

Sterile Barrier Integrity Task
Group Update



Experiment 2- What Hole Size Allows Penetration when Brownian Motion Drives?

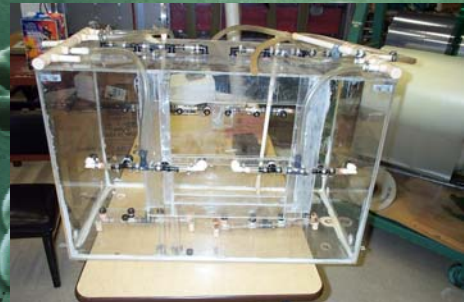
Identify the minimum hole size(s) through which *Bacillus subtilis* and *E. coli* K-12 penetrate a rigid tray when temperature and RH are standard and gravity serves as the driving force across the breached barrier

11/09/04

Sterile Barrier Integrity Task
Group Update



Experiment 2



11/09/04


Sterile Barrier Integrity Task
Group Update




Experiment 3-
What Hole Size Allows Penetration
when Flight is Simulated?

Identify the minimum hole size(s) through
which *Bacillus subtilis* and *E. coli* K-12
penetrate a rigid tray when temperature
and RH are standard and the package is
subjected simultaneously to vibration
and pressure differentials that simulate
those recorded during flight.


11/09/04 Sterile Barrier Integrity Task
Group Update



Experiment 3




11/09/04 Sterile Barrier Integrity Task
Group Update



Questions?

11/09/04 Sterile Barrier Integrity Task
Group Update



Thank You

11/09/04 Sterile Barrier Integrity Task
Group Update

