Why is Bedding Important?

- Maintain cow cleanliness & udder health
  - Clean, dry resting surface
  - Absorbs/drains surface moisture
  - Controls level of environmental bacteria

“*For many years the influence of environment & management has been recognized as a major contributor to udder health.*”

-D. Wolfgang, 2004

Desirable Bedding Characteristics

- Provide cushion
- Conform to resting cow
- Resists compaction
- Enhance traction
- Prevent injury
- Dry
- Inhibits microbial growth

Plentiful & Cost Effective
Major Pathogens Causing Mastitis

- Contagious
  - Staph. aureus
  - Strep. ag
  - Mycoplasma

- Environmental
  - Strep. Uberis
  - Strep. Dysgalactiae
  - Coliforms

Probability of Infection

Increased Bacteria Counts in the Environment
leads to
Increased Bacteria Counts on Udder Skin

Infections by Environmental Bacteria will Increase.

Bedding Bacteria Levels

- Minimal risk: Less than 300,000 cfu/g
- Moderate risk: 300,000 to 1,000,000 cfu/g
- High Risk: Greater than 1,000,000 cfu/g

Indicators Bedding Material & Management Working?

- Low incidence of environmental infections
- Excellent stall acceptance
- Cows are resting 12 or more hours per day
- Cows are clean
- Minimal hock abrasions & swelling
- Minimal lameness
Hygiene Scoring

- Score 1: objective
- Score 2: acceptable
- Score 3: zona de peligro
- Score 4: muy sucia
- Score 5: inaceptable

60%  30%  5% - 10%  <5%

Source: adapted from Chiappini et al. J.K. Reneau, Univ. of Minnesota, in J. Huelsen, Cow Signals.

Locomotion Scoring for Dairy Cattle

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<th>Bench Marks</th>
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<td>0.5%</td>
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Typical Resting Surface Alternatives

- Generously bedded stalls
  - 4” to 8” of bedding material
- Resilient stall beds with bedding layer
  - 1” or more of bedding material
  - Bedding amount depends on stall bed option
- Bedded Pens
  - 6” or more of bedding material
Basic Bedding Categories

- **Inorganic**
  - Drains moisture away from surface
  - Inert
  - May improve footing

- **Organic**
  - Absorbs surface moisture
  - Increased ability to support pathogen growth

“They all work and they all fail.”

Inorganic Bedding Materials

- Sand
- Limestone screenings
- Gypsum

Should not support bacteria growth

Sand is Excellent Bedding for Dairy Cows

- Conforms to the shape of resting cows
- Provides cushion
- Drains moisture away from the surface

Should not support bacteria growth

Sand is Excellent Bedding for Dairy Cows

- Can improve cow comfort
- Can improve cow cleanliness
- Can improve footing
- May reduce hock & knee injuries
- May reduce SCC & mastitis incidence

Must be managed properly
Sand is a Nuisance

- Heavy to handle
- Abrasive to equipment
- Wears hooves
- Polishes floor surfaces
- Invades feeding areas
- Settles in waterers

Sand Complicates Manure Handling

- Gets into the rumen
- Sticks to teats & udder
- Plugs drains
- Gets into filters
- Settles in milk tank

Sand is Excellent Bedding for Dairy Cows

“Every benefit you get from sand you earn.”

—Fred England, 1998

Desired Sand Bedding Characteristics

- Low organic matter content
- No debris or stones
  - <3mm
- Dry material
- Appropriate texture

Source: Gooch & Inglis
**Limestone Screenings**
- Should have physical characteristics similar to sand
- Often fine and prone to ‘packing’
- Can affect soil pH

**Gypsum**
- Soft sulfate mineral
- Absorbent
- Non-caustic
- May elevate H₂S₄ levels in manure slurry

**Recycled Sand as Bedding**
- Non-mechanical Separation

**Recycled Sand**
- Certified Mason Sand & Certified Concrete Sand
  - Water used to separate sand from manure
- Recycled flush water contains ‘bugs’ that like water
  - Proteus, Pseudomonas, Klebsiella

Source: Wolfgang, 2013
**Recycled Sand as Bedding**

- Allow washed reclaimed sand to drain 5 to 7 days
  - minimize organic material
- Take care in scooping piles
  - > organic material in lower several inches
- Handled properly is similar to fresh sand

**Sand Bedding Management**

- Typically requires 25 – 50 lbs/stall-day
  - Reducing volume reduces effectiveness
- Bedding addition – 1 x per week minimum
  - More consistent stall bed elevation
  - Reduced sand waste
  - Improved stall use
  - Easier manure handling

**Inorganic Bedding Management**

- Stall bed grooming
  - Levels & fluffs stall bed
  - May bring contaminated material to top

**Inorganic Bedding Management**

- Remove manure piles & soiled areas
  - 3 times per day minimum
  - Fill holes with dry material
Organic Bedding Materials

- Sawdust
- Shavings
- Waste wood
- Paper
- Straw
- Peanut hulls
- Crop residue
- Dried manure solids
- Recycled Horse Bedding

- Absorb moisture
- Support rapid growth of environmental mastitis pathogens when mixed with manure, urine & milk

Organic Bedding Materials

- Sawdust & Shavings
  - softwoods better than hardwoods
- Straw & Hulls
  - abundance of sugars, starches & amino acids
- Paper
  - mostly cellulose; low in sugars & amino acids
- Dried Manure Solids
  - typically have large bacterial numbers

Organic Bedding Materials

- Green sawdust containing bark
  - Associated with higher incidence of *Klebsiella* mastitis

- Straw bedding
  - Associated with higher incidence of mastitis from *Streptococcus Uberis*
  - Chopped straw typically has higher pathogen populations than long straw

Organic Bedding Materials

- Shredded paper
  - Low initial pathogen populations
  - Rapid moisture absorption
  - Compacts
  - Useful bedding amendment
### Organic Bedding Materials

- Pathogen numbers increase with decreasing particle size
- Damp particles stick to teat skin
  - Increasing opportunity for infection

### Bedding Bacteria Levels

- **Minimal risk:** Less than 300,000 cfu/g
- **Moderate risk:** 300,000 to 1,000,000 cfu/g
- **High Risk:** Greater than 1,000,000 cfu/g

---

**Bacteria Count vs. Particle Size**

<table>
<thead>
<tr>
<th>Material</th>
<th>#8 (Coarse) cfu/ml</th>
<th>#6 (Medium) cfu/ml</th>
<th>Bottom (Fines) cfu/ml</th>
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<tr>
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<td>462</td>
<td>933</td>
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<td>Sunflower Hulls</td>
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<td>Softwood Shavings</td>
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<tr>
<td>Aspen Sawdust</td>
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Source: Bey, 2002

*cfu = colony-forming units*
### Bedding Study

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Indicates potential for organism growth

### Kiln Dried Sawdust

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### Ground Peanut Shells

#### Zero Sample

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### Recycled Horse Bedding

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Organic Bedding Management

- Remove bedding from rear half of the stall daily and replace with fresh bedding

Source: Reneau, 2001

Organic Bedding Management

- Groom stalls 3 times per day minimum
  - Remove manure & soiled bedding
  - Cover wet & bare areas with bedding

Studies show “low” SCC herds cleaned stalls and average of 2.2 times/day

Studies show “high” SCC herds cleaned stalls and average of 1.6 times/day

Dried Manure Solids As Bedding?

- Bacterial composition similar to manure
  - E-coli, enterococcus
  - May have some klebsiella

Populations can ‘explode’ in right conditions

Source: Wolfgang, 2013
Dried Manure Solids

- 50 – 60% moisture
  - Falls apart after being squeezed

- Damp particles stick
  - Udder & teats
  - Hair coat

---

Digester / Screw Separator/ Aerated pile

<table>
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Screw Separator/ Compost Drum /Pile

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<td>&gt;10mil</td>
<td>&gt;10mil</td>
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</tbody>
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Source: Wolfgang, 2013
‘Dried’ Manure Solids

- Generously bedded
  - Bedding depth 4” or more
  - Groom stalls 3 times/day
  - Add bedding every 1 to 2 days

Bedded Packs

- Organic bedding materials
  - Warm to a desirable temperature for bacteria growth

‘Dried’ Manure Solids

- With resilient stall bed
  - Bedding depth 1” or more
  - Remove ‘old’ & add ‘new’ daily

Bedded Packs

- Overcrowding & poor bedding management typically lead to herd health problems
Inorganic Bedding Management

- Bedded packs
  - Provide adequate space & bedding
  - Groom bedded area regularly

Bedded Packs

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Aerated (Compost) Dairy Barns

May extend ‘useful life’ of bedding materials

Preferred Bedding Material

- Dry, fine wood shavings or sawdust
  - Straw & corn stalks not recommended
  - Avoid green and/or wet material

- Stirring is essential
  - Freshens surface / loosens & aerates pack
  - Breaks up manure piles & mixes them into pack

- Bedding interval varies with material & season
  - At or before time material sticks to cows
Dry, Comfortable Resting Area Benefits

- Reduced stress on feet
- Less injuries
- Cleaner cows
- Increased longevity
- Improved milk production
- Better udder health

Creating a Quality Resting Area

- Resting area access & size
- Stall design
- Bedding type & management
- Resting area grooming & management
- Manure management
- Ventilation system management
- Population
Desirable Bedding Characteristics

- Provide cushion
- Conform to resting cow
- Resists compaction
- Enhance traction
- Prevent injury
- Dry
- Inhibits microbial growth

Plentiful & Cost Effective

Establishment of Miscanthus (Miscanthus x giganteus) as an Alternate Bedding Supply

Steve Harnish
Central Manor Dairy LLC
Steve@cmdairy.com

Partial funding provided by a SARE farmer grant
Moisture levels in standing Miscanthus

11/20/13: 43%
12/20/13: 32%
01/20/14: 25.5%
02/20/14: 16.5%
03/14/14: 13%