Self-Reported Psychological Stress and Prevalence of Methicillin-Resistant Staphylococcus Aureus Nasal Carriage among Beef Meatpacking Workers in Nebraska

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MRSA

• Pathogenic bacteria resistant to beta-lactam antimicrobials

• 1.5% prevalence of MRSA colonization

• Public health impact (CDC, 2010)  
  – 82,042 infections  
  – 11,478 deaths

• MRSA types  
  – HA-MRSA (1960s)  
  – CA-MRSA (1990s)  
  – Livestock-associated MRSA (2000s)
LA-MRSA, Occupational Risk and Stress

- Prevalent in various food producing animals
- Occupational groups at risk:
  - Farmers (pig/veal calf/cattle)
  - Veterinarians
  - Slaughterhouse personnel
- Risk factors for transmission
  - Contact w/animals and animal byproducts
  - Workplace environmental contamination
  - Presence of skin-breaking wounds and infections
  - Stress???
- Biological stress response linked with immune suppression
- Stress factors associated with increased:
  - Infection susceptibility
  - Symptom severity
  - Illness duration
  - Pathogen carriage
- Psychological stressors in the slaughterhouse
  - Animal slaughter
  - Long work hours
  - Discrimination
  - Line speed
  - High workload
  - Low task variety

Study Aims and Hypotheses

**Primary aim:**
To examine association between self-reported psychological stress and MRSA colonization and infection risk among beef meatpackers in NE

**Hypothesis:**
Higher self-reported psychological stress will be associated with increased risk of MRSA carriage and infection

**Secondary aim:**
To examine the association between occupational factors (job category and hours worked per week) and self-reported psychological stress among beef meatpackers in NE

**Hypothesis:**
Kill floor work and working >40 hrs/wk will be associated with higher self-reported psychological stress
Methods

• Study design: cross-sectional survey (GWU IRB approval)

• Study population: 2000 member unionized workforce at NE beef meatpacking plant

• Subject recruitment:
  – convenience sample of 137 workers
  – Four-day enrollment at union Local office
  – Inclusion criteria: current plant employee, ≥18 y/o
  – Exclusion criterion: past 3 month travel outside U.S.

• Data collection: nasal swabs and questionnaires
  – Sociodemographic variables
  – Potential confounders
  – Occupational factors
  – Kessler 6-Item Psychological Distress Scale (K6)

Methods: K6 and Psychological Assessment

• Reliable, validated screen for significant psychological distress (SPD)

<table>
<thead>
<tr>
<th>Stress symptoms</th>
<th>Past month prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nervous</td>
<td>“...............of the time”</td>
</tr>
<tr>
<td>Hopeless</td>
<td>(0) None</td>
</tr>
<tr>
<td>Restless or fidgety</td>
<td>(1) A little</td>
</tr>
<tr>
<td>So sad that nothing could cheer you up</td>
<td>(2) Some</td>
</tr>
<tr>
<td>That everything was an effort</td>
<td>(3) Most</td>
</tr>
<tr>
<td>Worthless</td>
<td>(4) All</td>
</tr>
</tbody>
</table>

• Prevalence scores summed across symptoms (0-24)
• Total K6 score >12 = SPD
Methods: Statistical Analysis

- Descriptive statistics
- Shapiro-Wilk test for normality (age, work hrs/wk, K6 score)
- Mann-Whitney U-test for median K6 score differences
- Relative risk comparisons to test associations between all other main outcome and effects (95% CIs, exact p-values)

### Main outcome variables

- *S. aureus* carriage (Y/N)
- MRSA carriage (Y/N)
- SPD [K6 score > 12] (Y/N)
- Total K6 score (0-24)

### Main effect variables

- Kill floor worker (Y/N)
- Work hrs/week (≤40 vs >40)
- SPD [K6 score > 12], (Y/N)
- Total K6 score (0-24)

#### Results: Descriptive Statistics

**K6 scores:**

- Median: 1
- Range: 0-20

**Overall prevalence:**

- *S. aureus*: 26.3%
- MRSA: 4.4%
- SPD: 5.1%

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**Kessler 6-Item Psychological Distress Scale (K6) Scores**

**Nebraska Beef Meatpackers, 2012**

Note: Total K6 scores possible range from 0 to 24
Results: *S. aureus* and Stress

- SPD and K6 score were not associated with *S. aureus* carrier status

Results: MRSA and SPD

- SPD was not associated with MRSA carrier status
Results: MRSA and K6 Score

- K6 scores did not differ significantly by MRSA carrier status (p=0.71)

Results: Stress and Occupational Factors

- No significant associations with either SPD or K6 score
- Non-significant findings between work hours and SPD suggest a negative relationship
Results: SPD and Race

- Whites were more likely than non-whites to have SPD

![Bar chart showing Significant Psychological Distress (SPD) by Race]

<table>
<thead>
<tr>
<th></th>
<th>Whites</th>
<th>Non-Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPD</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>No SPD</td>
<td>4</td>
<td>123</td>
</tr>
</tbody>
</table>

Relative Risk = 9.53 (2.47, 36.80), p=0.01

Results: K6 Scores and Race

- White workers had statistically significant higher K6 scores than non-white workers

![Histogram showing Kessler 6-Item Psychological Distress Scale (K6) Scores by Race]

<table>
<thead>
<tr>
<th>Race</th>
<th>K6 Score</th>
<th>Median (min-max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td></td>
<td>2 (0-18)</td>
</tr>
<tr>
<td>Non-White</td>
<td></td>
<td>1 (0-20)</td>
</tr>
</tbody>
</table>

Mann-Whitney U-test, p=0.05
Discussion of Key Findings

• Beef meatpackers have elevated risk of MRSA nasal carriage and SPD compared to general population
• Higher psychological distress reported by whites
• No relationship between psychological distress and nasal colonization
• Kill floor work and work hours not related to psychological distress

Discussion of Limitations

• Small sample size
• Lack of control for confounders
• Selection bias – “healthy worker effect”
• Reporting bias – underreport of stress symptoms
• Misclassification of stress or carrier status
• Generalizability limited to unionized workforces in beef slaughter industry
Discussion: Strengths

- Novel investigation
- Source for hypothesis-generation
- Individual-level data
- Laboratory confirmation
- Union collaboration and support

Discussion: Recommendations

- Further investigation of the relationship between stress and colonization susceptibility
- Larger studies to characterize potential occupational stressors within the slaughterhouse working environment
- Better understanding of cultural bias for developing cross-culturally valid psychological assessment methods
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Questions?
References


Centers for Disease Control and Prevention/National Center for Health Statistics, National Health Interview Survey, January–June 2012, Sample Adult Core component.


