VCH Safety Summit: Reflections on COVID

2021 JOHSC conference

September 15, 2021

Virtual experience
Establishment of an ISO-Accredited PPE Testing Laboratory During a Global Pandemic
Health

America is running short on masks, gowns and gloves. Again.

Health-care workers are scrambling for supplies and reusing equipment as the coronavirus pandemic surges.
Collaborative PPE Assessment and Testing
Factors Contributing to PPE Shortage

Fig. 2. Factors contributing PPE shortage.
**PPE Crisis Capacity Strategy**

How do we ensure we don’t run out of a PPE item?

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**Flowchart to Determine if an N95 FFR Crisis Capacity Strategy Is Needed**

1. **Evaluate Adequacy of Current N95 FFR Inventory and Supply Chain**
   - Is your current N95 FFR inventory and supply chain equal to or greater than your PPE needs?
   - Are there N95 FFRs available from local healthcare coalitions and federal, state, and local public health partners (e.g., public health emergency preparedness and response staff) that can cover your PPE needs based on your burn rate and ability to procure more PPE when needed?
   - Use the Personal Protective Equipment (PPE) Burn Rate Calculator to help you plan and optimize the use of PPE during the response to coronavirus disease 2019 (COVID-19).
   - **Yes**
   - **No**

2. **Evaluate Availability of Other Respirators in Your Inventory**
   - Are there NIOSH-approved respirators that meet or exceed the level of protection of N95 FFRs available in your inventory or from the supply chain to cover your PPE needs?
   - Are there NIOSH-approved respirators available from local healthcare coalitions and federal, state, and local public health partners (e.g., public health emergency preparedness and response staff) that can cover your PPE needs?
   - Other devices that can be used include N99, N100, P95, P99, P100, R95, R99, and R100 FFRs, elastomeric respirators, and powered air-purifying respirators (PAPRs).
   - The use of these devices is included in the conventional capacity strategies to conserve the supply of N95 FFRs. More information on other NIOSH-approved respiratory protective devices can be found [here](#).
   - **Yes**
   - **No**

3. **Evaluate Extended Use of N95 FFRs**
   - Can extended use of N95 FFRs (using the same N95 FFR for more than one patient contact) cover your PPE needs based on your burn rate and ability to procure more PPE when needed?
   - More information on extended FFR use and other contingency capacity strategies can be found [here](#).
   - **Yes**
   - **No**

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You are not operating at crisis capacity. Follow conventional capacity strategies or if shortages are expected, contingency capacity strategies. Continue to monitor current respiratory protection needs and usage. More information on optimization strategies can be found [here](#).
Moist Heat, Microwave-generated steam & UV-C and Vaporized Hydrogen Peroxide most effective
Over 150,000 N95 FFRs reprocessed at 38 healthcare facilities across BC
U.S. regulators and state officials are finding a significant number of imported N95-style masks fall short of certification standards, complicating the response to the coronavirus crisis and potentially putting some front-line workers at greater risk.

Recent tests by the National Institute for Occupational Safety and Health found that about 60% of 67 different types of imported masks tested allowed in more tiny particles in at least one sample than U.S. standards normally permit.

One mask that Niosh tested, sold in packaging bearing unauthorized Food and Drug Administration logos, filtered out as little as 35% of particles. Another, marked KN95, a Chinese standard similar to N95, had one sample test below 15%, far short of the 95% it advertised, Niosh said. KN95 and N95 both refer to standards that call for masks to block 95% of very small particles.

The Niosh tests, combined with recalls and additional testing from multiple states, show that millions of substandard masks have been imported from China and other countries as the need for protective gear for workers confronting the pandemic has skyrocketed.
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Millions of counterfeit N95 masks distributed to health care workers in the U.S.

Masks imitating the real thing are flooding U.S. ports, and authorities can hardly keep pace.
The Need for Canadian PPE Testing

Global PPE supply chains severely disrupted

Heavy PPE usage through the world, we faced an imminent shortage during the spring

Procurement of PPE through non-traditional supply chains

Need for internal PPE testing capacity in Canada

Third party testing required
Primarily US, long turnaround time, high cost
A Multidisciplinary Team Built an ISO-accredited PPE Testing Laboratory
# PPE Testing Laboratory Test Menu

<table>
<thead>
<tr>
<th>PPE</th>
<th>Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N95 respirator</strong></td>
<td>NaCl Filter Efficiency (TEB-APR-STP-0059)</td>
<td>This test measures the filtration efficiency of respirators using NaCl aerosols</td>
</tr>
<tr>
<td></td>
<td>Quantitative fit testing (CSA Z94.4-18 Section 9, Annex C)</td>
<td>This test measures the fit of respirators to ensure a good seal on the users face based on particle counting technology in the PortaCount machine</td>
</tr>
<tr>
<td></td>
<td>N95 inhalation and exhalation efficiency (STP-007, STP-003)</td>
<td>Measures the inhalation and exhalation breathing resistance for air-purifying respirators, including N95 filtering face-piece respirators.</td>
</tr>
<tr>
<td><strong>N95 respirator and Medical Masks</strong></td>
<td>Fluid Resistance (ASTM – F1862)</td>
<td>Evaluates resistance of medical face masks to penetration by the impact of a small volume (~2 mL) of a high-velocity stream of synthetic blood.</td>
</tr>
<tr>
<td><strong>Medical Masks</strong></td>
<td>Breathability (differential pressure)</td>
<td>Measures the differential pressure required to draw air through a medical face mask.</td>
</tr>
<tr>
<td></td>
<td>Bacterial Filtration and Particulate Filtration efficiency (ASTM F2101 – BFE, F2299 – PFE).</td>
<td>Measures filtration efficiency of medical masks using a viable bacterial test organism and a 0.1 micron latex particle</td>
</tr>
<tr>
<td></td>
<td>Flame Spread</td>
<td>Measures the flammability of the mask material</td>
</tr>
<tr>
<td><strong>Surgical/Isolation Gown</strong></td>
<td>Water impact testing (AATCC TM42-2017e)</td>
<td>This test measures the resistance of fabrics to the penetration of water by impact, predicting the fluid resistance of fabrics and PPE items</td>
</tr>
<tr>
<td></td>
<td>Hydrostatic Water Pressure Test (AATCC - 0127)</td>
<td>Measures the resistance of a gown or fabric to the penetration of water under a constantly increasing pressure.</td>
</tr>
</tbody>
</table>
Laboratory Testing of PPE Identifies PPE that are Unsafe for Use

<table>
<thead>
<tr>
<th>PPE Item</th>
<th>Sample</th>
<th>Test</th>
<th>Number Tested</th>
<th>Total Number of PPE Items</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>N95 Respirator</td>
<td>N95 “A”</td>
<td>Filtration Efficiency</td>
<td>1141</td>
<td>156,000</td>
<td>Fail</td>
</tr>
<tr>
<td></td>
<td>KN95 “A”</td>
<td>Filtration Efficiency</td>
<td>167</td>
<td>1,200,000</td>
<td>Fail</td>
</tr>
<tr>
<td></td>
<td>KN95 “B”</td>
<td>Filtration Efficiency</td>
<td>301</td>
<td>1,300,000</td>
<td>Safe for use</td>
</tr>
<tr>
<td></td>
<td>KN95 “C”</td>
<td>Filtration Efficiency</td>
<td>32</td>
<td>450,000</td>
<td>Safe for use</td>
</tr>
<tr>
<td></td>
<td>KN95 “D”</td>
<td>Filtration Efficiency</td>
<td>50</td>
<td>1,000,000</td>
<td>Fail</td>
</tr>
<tr>
<td>Gowns</td>
<td>GOWN “A”</td>
<td>Spray Impact and Hydrostatic Pressure</td>
<td>50</td>
<td>250,000</td>
<td>Safe for use (AAMI Level 2)</td>
</tr>
<tr>
<td></td>
<td>GOWN “B”</td>
<td>Spray Impact and Hydrostatic Pressure</td>
<td>32</td>
<td>100,000</td>
<td>Fail</td>
</tr>
<tr>
<td></td>
<td>GOWN “C”</td>
<td>Spray Impact and Hydrostatic Pressure</td>
<td>32</td>
<td>1,00,000</td>
<td>Fail</td>
</tr>
<tr>
<td></td>
<td>GOWN “D”</td>
<td>Spray Impact and Hydrostatic Pressure</td>
<td>20</td>
<td>14,000</td>
<td>Safe for use (AAMI Level 2)</td>
</tr>
</tbody>
</table>
Thank you