A nasal swab’s simple shape belies its complex function - to safely collect a sample of virus from a patient’s nasal passage and deliver that intact viral sample (positive Covid-19 sample/ control) from a test tube into rtPCR for further analysis.

The results from these tests are not intended to be an absolute indicator of a performant swab, but rather serve as a comparative measure that, when combined with other laboratory testing, can provide a more comprehensive analysis of swab performance in a clinical laboratory setting.

**Absorption Protocol:**
Purpose: Assesses the ability of the swab to absorb and elute a virus sample.

**Bending Protocol:**
Purpose: Assesses the ability of the neck of a swab to withstand repeated bending without breaking.

**Indentation Protocol:**
Purpose: Assesses the ability of the swab to yield specifically at the 80 mm vial that accompanies the Cepheid kit.

**Eltion Protocol:**
Purpose: Assesses the ability of the swab to absorb and elute a microorganism (in this case the bacteria Staph aerusa) without breaking.

**Abrasion Protocol:**
Purpose: Assesses the abrasion qualities of the swab tip, as a surrogate for the risk of puncture risk.

**Gold Standard 3D Printed Swabs**
- Medtronic
- Formlabs
- Envisiontec
- USF Origin
- Abiogenix
- Northwell
- BD
- Copan
- Puritan Medical Products
- University of South Florida (USF; FormLabs 3D print)
- University of Massachusetts Lowell (UMass Lowell)
- EnvisionTec
- USF (FormLabs 3D print)
- Northwell (FormLabs)
- Envisiontec
- Copan FLOQ
- BD N/A*

**Initial testing included six 3D-printed nasal swabs that were either commercially available and/or had open source files.**

- Aliens: https://www.aliens3d.com/
- Nortech (Fomatec 3D print) https://formlabs.com/covid-19-response/covid-test-swabs/
- University of South Florida (USF; FormLabs 3D print)
- https://envisiontec.com/3d-printed-nasal-swabs/
- Origin: https://www.origin.io/npswab/
- Revolution Medical https://www.revolutionmedical.com/fattracks/swabs/

**Testing in progress; results are up to date of as of August 17, 2020.**

**TESTING IN PROGRESS**

**VENTILATION TESTING**

**MECHANICAL TESTING**

**ABSORPTION TESTING**

**INDENTATION TESTING**

**RT-PCR COMPATIBILITY**

**TESTING IN PROGRESS**

**Abrasiveness Test**

**Increase in Viruses**

**TESTING IN PROGRESS**

**Abiogenix**

**Northwell**

**BD**

**Copan**

**Puritan Medical Products**

**University of South Florida (USF; FormLabs 3D print)**

**University of Massachusetts Lowell (UMass Lowell)**

**EnvisionTec**

**USF (FormLabs 3D print)**

**Northwell (FormLabs)**

**Envisiontec**

**Copan FLOQ**

**BD N/A**

**Swabs**

<table>
<thead>
<tr>
<th>Swab Type</th>
<th>Nanoparticles</th>
<th>FDA Vial Extent Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medtronic</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Formlabs</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Envisiontec</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>USF Origin</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Abiogenix</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Northwell</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>BD</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Copan</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Puritan</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>University of South Florida (USF; FormLabs 3D print)</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>University of Massachusetts Lowell (UMass Lowell)</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>EnvisionTec</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>USF (FormLabs 3D print)</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Northwell (FormLabs)</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Envisiontec</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>Copan FLOQ</td>
<td>PASS</td>
<td>PASS</td>
</tr>
<tr>
<td>BD N/A*</td>
<td>PASS</td>
<td>PASS</td>
</tr>
</tbody>
</table>

**Eltion Protocol:**
Purpose: Assesses the ability of the swab to absorb and elute a microorganism (in this case the bacteria Staph aerusa) without breaking.

**Abrasion Protocol:**
Purpose: Assess the abrasion qualities of the swab tip, as a surrogate for the risk of puncture risk.

**Indentation Protocol:**
Purpose: Assess the indentation qualities of the distal tip of a swab into compliant material, as a surrogate for potential puncture risk.

**3D Printed Swabs**

**Initial testing included 3D-printed nasal swabs that were either commercially available and/or had open source files.**

- Aliens: https://www.aliens3d.com/
- Nortech (Fomatec 3D print) https://formlabs.com/covid-19-response/covid-test-swabs/
- University of South Florida (USF; FormLabs 3D print)
- https://envisiontec.com/3d-printed-nasal-swabs/
- Origin: https://www.origin.io/npswab/
- Revolution Medical https://www.revolutionmedical.com/fattracks/swabs/

**3D Printed Swabs Initial testing included 3D-printed nasal swabs that were either commercially available and/or had open source files.**

- Aliens: https://www.aliens3d.com/
- Nortech (Fomatec 3D print) https://formlabs.com/covid-19-response/covid-test-swabs/
- University of South Florida (USF; FormLabs 3D print)
- https://envisiontec.com/3d-printed-nasal-swabs/
- Origin: https://www.origin.io/npswab/
- Revolution Medical https://www.revolutionmedical.com/fattracks/swabs/

**Reliability of 3D Printed Swabs**

**3D Printed Swabs Initial testing included 3D-printed nasal swabs that were either commercially available and/or had open source files.**

- Aliens: https://www.aliens3d.com/
- Nortech (Fomatec 3D print) https://formlabs.com/covid-19-response/covid-test-swabs/
- University of South Florida (USF; FormLabs 3D print)
- https://envisiontec.com/3d-printed-nasal-swabs/
- Origin: https://www.origin.io/npswab/
- Revolution Medical https://www.revolutionmedical.com/fattracks/swabs/

**Testing in progress; results are up to date of as of August 17, 2020.**

**3D Printed Swabs Initial testing included 3D-printed nasal swabs that were either commercially available and/or had open source files.**

- Aliens: https://www.aliens3d.com/
- Nortech (Fomatec 3D print) https://formlabs.com/covid-19-response/covid-test-swabs/
- University of South Florida (USF; FormLabs 3D print)
- https://envisiontec.com/3d-printed-nasal-swabs/
- Origin: https://www.origin.io/npswab/
- Revolution Medical https://www.revolutionmedical.com/fattracks/swabs/

**Reliability of 3D Printed Swabs**

**3D Printed Swabs Initial testing included 3D-printed nasal swabs that were either commercially available and/or had open source files.**

- Aliens: https://www.aliens3d.com/
- Nortech (Fomatec 3D print) https://formlabs.com/covid-19-response/covid-test-swabs/
- University of South Florida (USF; FormLabs 3D print)
- https://envisiontec.com/3d-printed-nasal-swabs/
- Origin: https://www.origin.io/npswab/
- Revolutio...