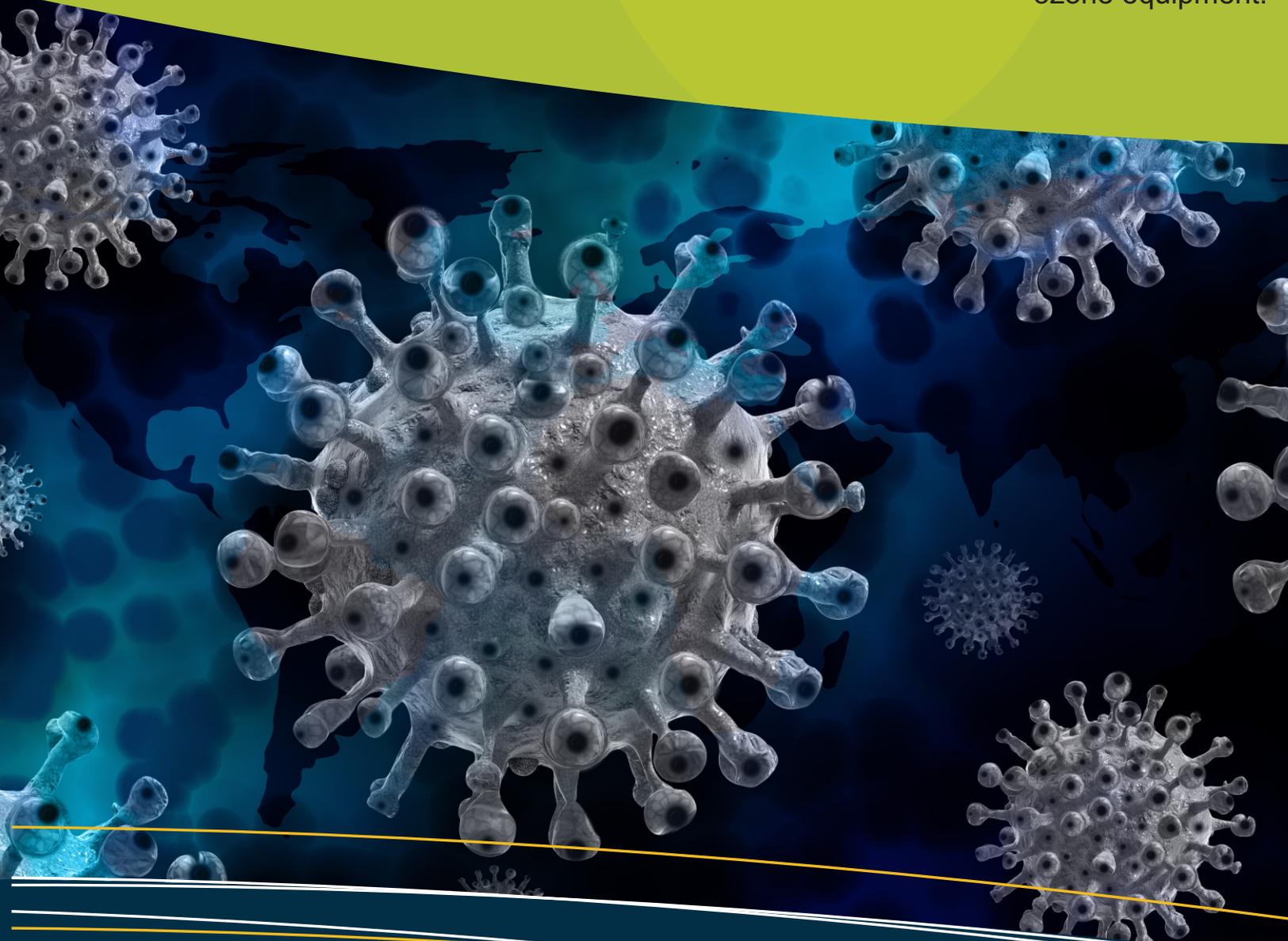


- ▶ **Six-log Covid-19 Deactivation Protocol**
- ▶ **Rapidly Disinfect Rooms, Buildings**
- ▶ **ISO Certified Testing for Compliance**
- ▶ **Now Available for Licensing**
- ▶ **Licensing available for contractors, remediation companies, clean-up specialists**

Guaranteed disinfection of surfaces and materials using the Environ Covid-19 Deactivation Protocol.

Rapid and complete disinfection of buildings, rooms and objects with optional ISO-Certified testing for compliance and quality control.

Environ provides licensing of the protocol, training, safety training and ozone equipment.

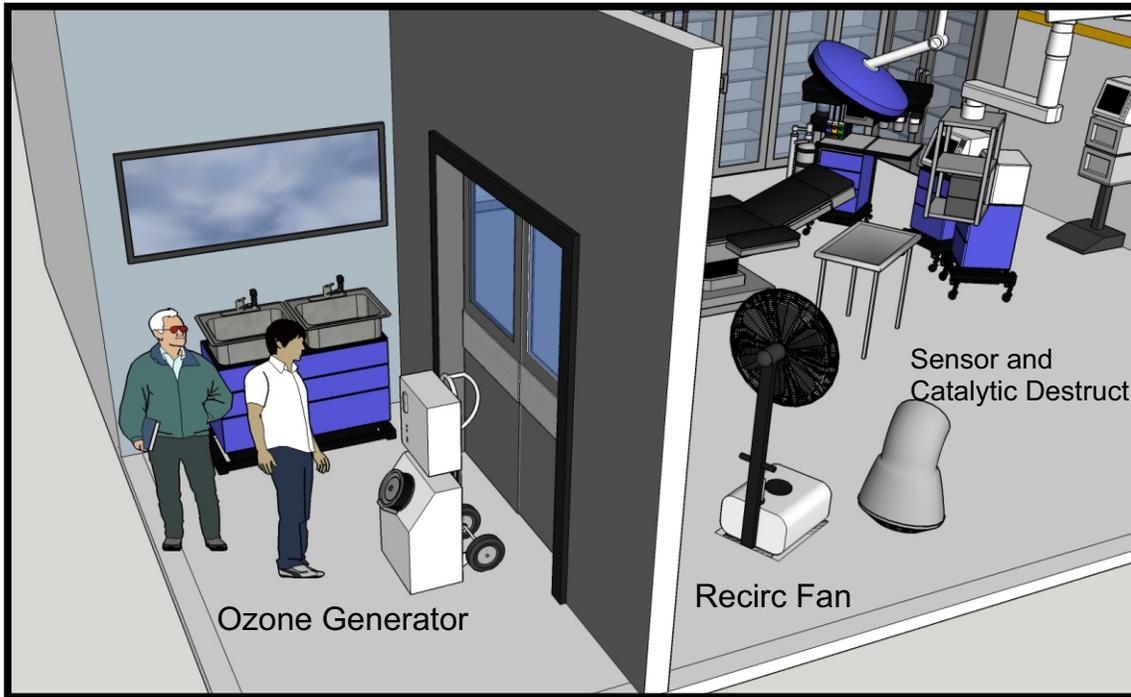


**envron**Ozone

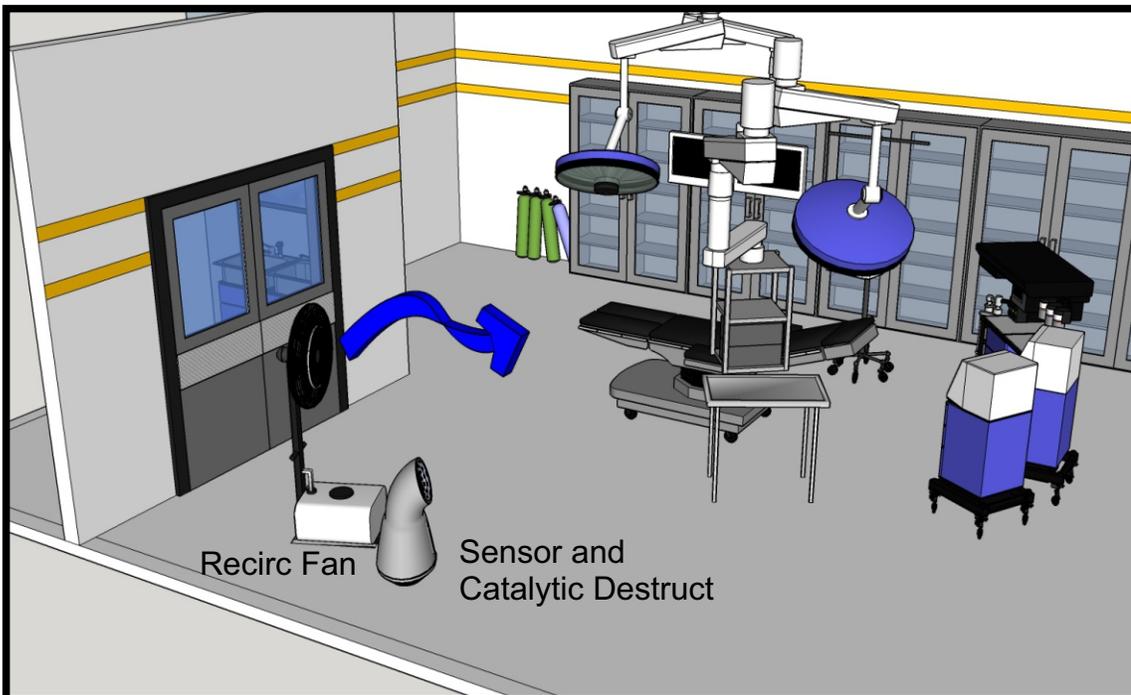
Environ - Ozone Application Specialists

Environ Environmental Ltd.  
Tel 306-924-3040 fax - 306-924-3066  
e-mail - [afinney@envronozone.com](mailto:afinney@envronozone.com)

# Envron Rapid Covid-19 Deactivation Protocol - Now Available for Licensing



**Step 1**  
Ensure people have vacated the room. Ozone system is put in place.

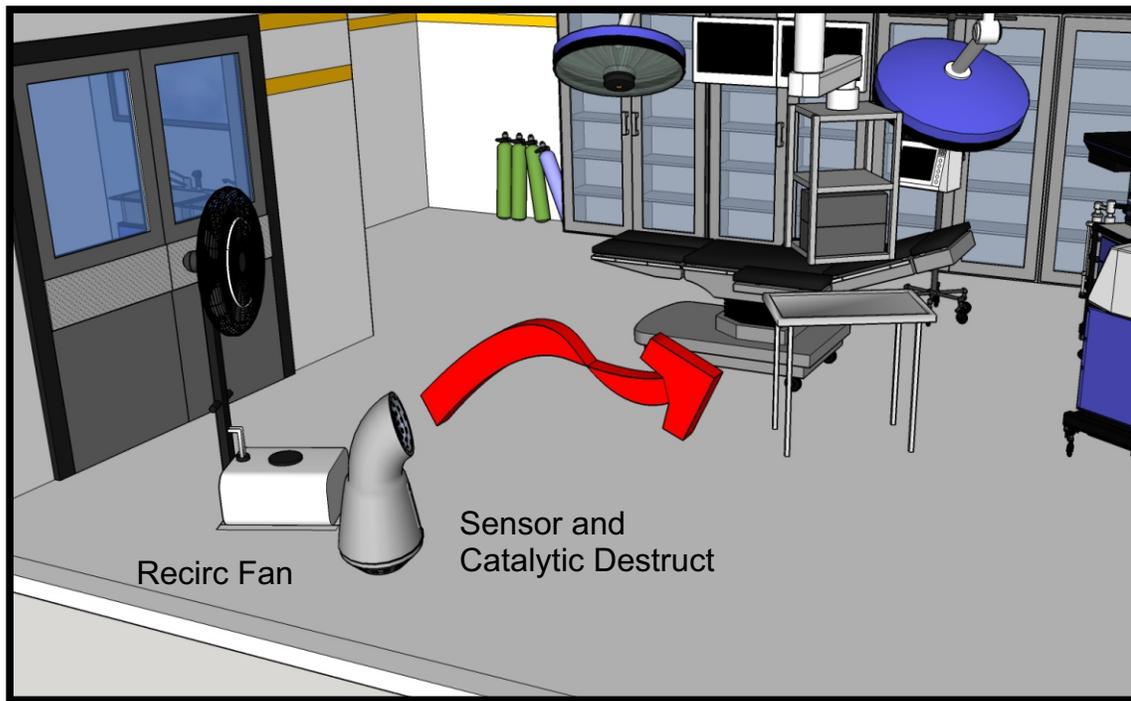


**Step 2**  
Ozone flows into the room and is circulated. Ozone levels are monitored for protocol compliance.

**Licensing available for contractors, remediation firms, clean-up specialists**

**envronOzone**

Envron Environmental Ltd. / Tel 306-924-3040 fax - 306-924-3066 / [afinney@envronozone.com](mailto:afinney@envronozone.com)  
<https://envronozone.com/the-envron-covid-19-disinfection-protocol.htm>



**Step 3**  
 After disinfection,  
 residual Ozone  
 is quickly destroyed  
 with a catalytic  
 destruct unit.

## **6-Log reduction with optional on-site ISO-certified lab testing**

### **Ozone Advantages**

- Six-log Covid-19 inactivation
- Low-cost ISO certified laboratory testing available for compliance
- Fast Acting - rooms are put back into service immediately
- Ozone reverts back to oxygen - no harmful residuals
- The most cost-effective system on the market
- Completely safe for workers and customers
- Trained personnel administer ozone
- Systems can be permanently stationed if required
- Ozone will not harm materials in rooms
- Ozone gas permeates all areas of the room
- Secondary disinfection of non-target viruses and bacteria
- Room odors are destroyed in the process

### **EnvironOzone**

- Over 30 years ozone experience
- Systems range from small to large
- Numerous systems in the field in Europe, North America and the Middle East
- The only ozone company to offer a guaranteed Covid-19 protocol
- ISO Laboratory test results available for compliance, audit and safety testing
- Safety is a top priority in handling ozone
- Ozone systems can be permanently mounted and training is available for ozone application

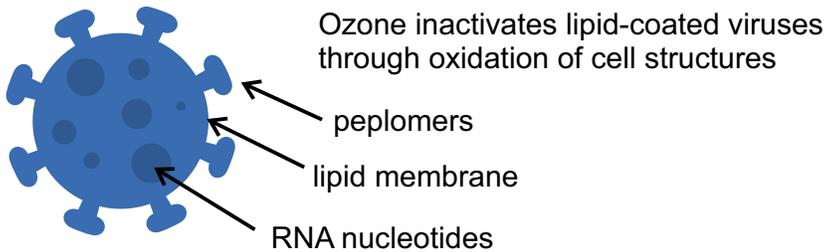
**EnvironOzone**

Contact: Allan Finney  
 ph: 306-924-3040 (direct)  
 email - [afinney@envronozone.com](mailto:afinney@envronozone.com)

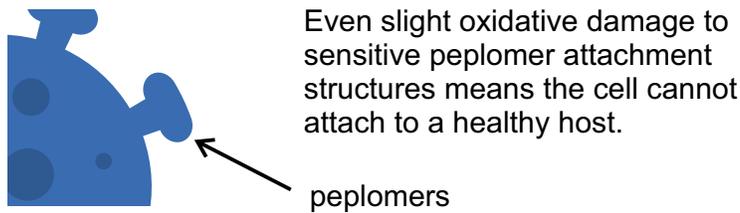
**envronOzone**

# Deactivation of Coronavirus using Ozone

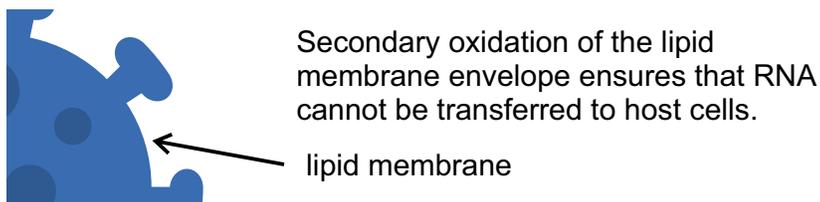
## Anatomy of a Coronavirus



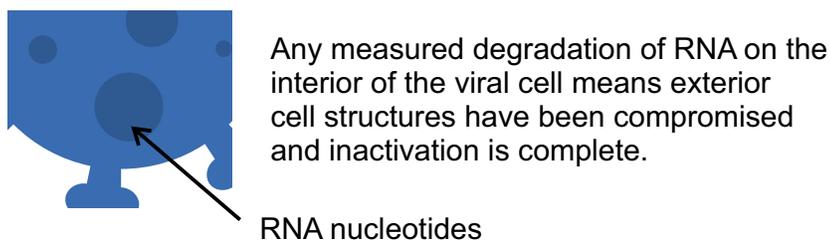
### 1. Ozone Initial Reaction - Peplomers



### 2. Ozone Secondary Reaction - Lipid Membrane



### 3. Ozone Final Reaction - Destruction of Viral RNA



***The Environ Protocol provides laboratory ISO certified RNA testing for compliance, quality control and auditing purposes - see attached laboratory report.***

## ***Coronavirus Oxidation - Summary***

### ***1. Initial Ozone Reaction - Peplomers***

Peplomers are finely-tuned receptor mechanisms of the viral cell and are designed to initiate binding to host cells. Peplomers work with a double bond process and as such even slight oxidative damage to these structures will render the virus non-pathogenic. Peplomers provide the reactive surface for highly energetic O<sub>3</sub> molecules and account for initial or "instant" ozone reaction with the viral cell.

### ***2. Secondary Reaction - Lipid Membrane***

In a healthy Coronavirus cell, the lipid membrane provides protection for and enables transference of the Viral RNA to the host cell. Coronavirus lipid membranes are made up of phosphoproteins and glycoproteins which are also highly susceptible to oxidative damage. Any lipid membrane damage ensures RNA transfer to a host cell cannot take place.

### ***3. Destruction of Viral RNA***

The last oxidative reaction in the viral cell is the interior RNA structure. Testing for lipid or peplomer damage is not practical. However, if RNA is degraded or damaged, the two above-noted reactive processes must have occurred. There is no way for RNA damage to occur on the inside of the cell without destruction of the outer cell structures.

### ***4. Field Testing***

Environ's protocol provides field testing of the percentage degradation of viral RNA in relation to standard Covid samples using commercial ISO-certified lab tests. Typical RNA degradation is measured at +90% compared to standard samples. Laboratory measurement of RNA damage indicates successful oxidation and inactivation of peplomers and penetration of the lipid membrane in addition to the damage to the viral RNA itself (see attached lab report).



# EnvironOzone Protocol - Oxidative Processes and Test Results



## 6-Log Reduction of Covid-19 on Surfaces

Environ's protocol provides a chain of inference of at least a 6-log reduction of the Covid-19 coronavirus.

How this is determined:

**Step 1** - peplomer processes are highly sensitive to oxidation by Ozone. Since we are not only inactivating the peplomers but destroying the fundamental structure of the cell itself (see below), a conservative estimate would be a 2 to 3 log inactivation of the Covid virus at this stage in the oxidation process.

**Step 2** - A healthy lipid membrane is required for transfer of viral RNA to host cells. Any compromise of the outer lipid membrane means that the viral RNA transfer process is inactivated. Since the Environ protocol is able to degrade interior RNA, the lipid membrane has been compromised and a further 2 to 3 log inactivation can be assumed.

**Step 3** - a measurement of any degradation of viral RNA can only mean that the exterior structures of the cell have been damaged by oxidation. The peplomers and the lipid membrane are not only required for transfer of RNA to a healthy host cell but they also provide protective barriers for the viral RNA which is housed inside the lipid membrane. Environ's protocol provides for a

measurable +90% degradation of RNA, thus ensuring complete inactivation.

**Conclusion** - Since the viral cell cannot attach to a healthy cell because of peplomer damage and since penetration of the lipid membrane ensures viral RNA cannot be transferred (as evidenced by +90% RNA degradation), a chain of inference can be very conservatively estimated as a 6-log inactivation (see attached lab report).



*Ozone systems can be mobile or permanently mounted*





## **Coronavirus - Susceptibility to Ozone**

Due to the excess energy inherent in the ozone molecule, ozone provides effectiveness across the entire Coronavirus spectrum. In light of its pan-virucidal profile, Ozone also offers the advantage of existing as a gas, with its attendant ability to disinfect poorly accessible spaces.

Moreover, ozone has the distinct benefit of reverting to oxygen, while liquid-based disinfectants such as bleach are likely to damage the surfaces to which they are applied and to leave toxic residues.

### ***Lipid-Enveloped Viruses Sensitive to Oxidation***

Some viruses are more susceptible to ozone's action than others. It has been found that lipid-enveloped viruses including Coronaviruses are the most sensitive to oxidation processes. This makes intuitive sense, since enveloped viruses are designed to blend into the dynamically constant milieu of their mammalian hosts.

hosts. This includes hepatitis B and C, herpes 1 and 2, Cytomegalus (Epstein-Barr), HIV 1 and 2, Influenza A and B, West Nile virus, Togaviridae, Eastern and Western equine encephalitis, rabies, and Filiviridae (Ebola, Marburg) and of course Coronaviruses among others.

The envelopes of viruses provide for intricate

cell attachment, penetration, and cell exit strategies.

Peplomers, finely tuned to adjust to changing receptors on a variety of host cells, constantly elaborate slightly new glycoprotein configuration under the direction of portions of the viral genome, thus adapting to host cell defenses. As such, Coronavirus envelopes are fragile and are particularly sensitive to damage by oxidation.

Ozone is the most powerful commercially available oxidizer on the market and can thus easily disrupt peplomer and lipid membrane processes. Lipid enveloped viruses are readily inactivated by ozone via the oxidation of their envelope lipoproteins and glycoproteins (A key 1985; Shinriki 1988; Vaughn 1990; Wells 1991; Carpendale 1991).

### ***The denaturation of virions through direct contact with ozone.***

Ozone, via this mechanism, disrupts viral proteins, lipoproteins, lipids, glycolipids, or glycoproteins. The presence of numerous double bonds in these molecules makes them particularly vulnerable to the oxidizing effects of ozone that readily donates its oxygen atom and accepts electrons in redox reactions.

Unsaturated bonds are thus reconfigured, molecular architecture is disrupted, and breakage of the envelope ensues. Deprived of an envelope, virions cannot sustain nor replicate themselves.

# Typical 2019-Novel Coronavirus (SARS-COV-2) Real-Time RT-PCR Panel Report

Detection of biomarkers by reverse transcriptase quantitative Polymerase Chain Reaction (RT-qPCR)

## Abbreviations

ND: Not Detected    DNQ: Detected Not Quantifiable    Ct: Cycle Threshold  
 Results reported based Guidance of CDC-006-00019, Revision: 02, Instructions for Use  
 N1 and N2 are RNA markers associated with SARS-COV-2 virus.  
 Mouse Lung ACTB is an RNA control added as an internal control.

SM #	Sample ID	Date Collected	Time Collected	Analysis Requested	RT-qPCR Result	Reaction (Ct)	Processed Date	Extraction Date	Analysis Date	Plate ID
SM20G14099	S0			2019 nCoV_N1	Detected	30.59	2020-07-13	2020-07-14	2020-07-14	20200714_q01
SM20G14100	S1	2020-07-06		2019 nCoV_N1	Detected	35.39	2020-07-13	2020-07-14	2020-07-14	20200714_q01
SM20G14104	S2	2020-07-06		2019 nCoV_N1	Detected	34.4	2020-07-13	2020-07-14	2020-07-14	20200714_q01
SM20G14105	S3	2020-07-06		2019 nCoV_N1	Detected	35.9	2020-07-13	2020-07-14	2020-07-14	20200714_q01
SM20G14106	S4	2020-07-06		2019 nCoV_N1	Detected	34.53	2020-07-13	2020-07-14	2020-07-14	20200714_q01
SM20G14107	S5	2020-07-06		2019 nCoV_N1	Detected	30.61	2020-07-13	2020-07-14	2020-07-14	20200714_q01
SM20G14108	S0	2020-07-06		2019 nCoV_N2	Detected	31.51	2020-07-13	2020-07-14	2020-07-14	20200714_q02
SM20G14109	S1	2020-07-06		2019 nCoV_N2	Detected	35.5	2020-07-13	2020-07-14	2020-07-14	20200714_q02
SM20G14110	S2	2020-07-06		2019 nCoV_N2	Detected	35.13	2020-07-13	2020-07-14	2020-07-14	20200714_q02
SM20G14111	S3	2020-07-06		2019 nCoV_N2	Detected	35.91	2020-07-13	2020-07-14	2020-07-14	20200714_q02
SM20G14112	S4	2020-07-06		2019 nCoV_N2	Detected	35.39	2020-07-13	2020-07-14	2020-07-14	20200714_q02
SM20G14113	S5	2020-07-06		2019 nCoV_N2	Detected	30.86	2020-07-13	2020-07-14	2020-07-14	20200714_q02
SM20G14114	S0	2020-07-06		Mouse Lung ACTB SPC	Detected	24.48	2020-07-13	2020-07-14	2020-07-14	20200714_q03
SM20G14115	S1	2020-07-06		Mouse Lung ACTB SPC	Detected	24.44	2020-07-13	2020-07-14	2020-07-14	20200714_q03
SM20G14116	S2	2020-07-06		Mouse Lung ACTB SPC	Detected	24.58	2020-07-13	2020-07-14	2020-07-14	20200714_q03
SM20G14117	S3	2020-07-06		Mouse Lung ACTB SPC	Detected	24.65	2020-07-13	2020-07-14	2020-07-14	20200714_q03
SM20G14118	S4	2020-07-06		Mouse Lung ACTB SPC	Detected	24.47	2020-07-13	2020-07-14	2020-07-14	20200714_q03
SM20G14119	S5	2020-07-06		Mouse Lung ACTB SPC	Detected	24.66	2020-07-13	2020-07-14	2020-07-14	20200714_q03

Sample Type	Sample ID	N1 (delta Ct)	N2 (delta Ct)	N1 (percent reduction)	N2 (percent reduction)
Control	S0	NA	NA	NA	NA
Control	S5	NA	NA	NA	NA
Treatment	S1	4.79	4.32	96.38%	94.98%
Treatment	S2	3.8	3.94	92.81%	93.50%
Treatment	S3	5.3	4.73	97.46%	96.22%
Treatment	S4	3.93	4.21	93.44%	94.59%

**Typical Laboratory  
Test Results  
>90% RNA  
Degradation**

Control Type	Target	SM-#	Ct	Result
Swab POS 2020-07-14	2019 nCoV_N1	SM20G14120	29.37	PASS
Swab POS 2020-07-14	2019 nCoV_N2	SM20G14121	29.71	PASS
Swab POS 2020-07-14	Mouse Lung ACTB SPC	SM20G14122	25.55	PASS
Swab NPEC 2020-07-14	2019 nCoV_N1	SM20G14123	ND	PASS
Swab NPEC 2020-07-14	2019 nCoV_N2	SM20G14124	ND	PASS
Swab NPEC 2020-07-14	Mouse Lung ACTB SPC	SM20G14125	24.84	PASS

**PLEASE NOTE:**  
 RNA testing was conducted at an ISO 17025  
 accredited environmental lab that is  
 certified for SARS-CoV-2 testing.  
 Full laboratory results and access to  
 laboratory personnel is available.