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ASX: NVU

Nanoveu Antiviral Protectors to Target Coronaviruses

Highlights:

- **Nanoveu to incorporate antiviral nanotechnology into smartphone and tablet protective screens and cases, targeting late Q2 / early Q3 2020 product availability**
- **Initial testing on the top layer of Nanoveu's planned products has demonstrated Nanoveu's technology to be effective against viruses and bacteria – including influenza A (subtype H3N2) and E. coli**
- **Independent laboratories in the USA and Singapore have been engaged to conduct testing on prototypes for the human coronavirus OC43 (HCoV-OC43) (a betacoronavirus), which is the same genus as SARS-CoV-2 (the virus that causes COVID-19)**
- **Procurement for the first production run of smartphone protective screens is underway**
- **Nanoveu's antiviral nanotechnology is considerably improved upon compared to existing anti-bacterial smartphone protective screens and cases which do not protect against viruses**
- **Nanoveu is investigating pathways to market with potential for pre-orders in parallel with product development and production, targeting products being available in late Q2 2020 / early Q3 2020**

For a full copy of the ASX Announcement, please visit:
https://www.asx.com.au/asxpdf/20200415/pdf/44gz4dq1tn5jst.pdf

Nanoveu Limited ("Nanoveu") has developed an antiviral nanotechnology which it is applying to smartphone and tablet protective screens and cases.

The technology has been developed in-house by the Nanoveu research team and its partners and testing has confirmed the technology to be effective against Influenza virus (H3N2) A/Kitakyusyu/159/93 and Feline calicivirus (F9 strain) viruses, as well as against bacteria such as E. coli.

Commenting on the antiviral nanotechnology, Nanoveu Executive Chairman and CEO Alfred Chong said:

"Coincident with the advent of COVID-19, Nanoveu was presented with an opportunity to advance an antimicrobial technology which is effective in providing protection against viruses. Nanoveu commenced its research for this product line in second half of 2019, and I am pleased to see initial results validate our decision to investigate further."

"Mobile phones are both ubiquitous and rely upon touch to operate, making them prime candidates for the spread of disease. Therefore, we anticipate that there will be strong interest in a technology which can protect phone users from viruses and bacteria in a way which is non-invasive and unobtrusive."

"This product is exceptionally exciting as it combines Nanoveu's nanotechnology specialisation with an innovative solution which is expected to assist in resolving a major concern for many people around the world."

Addressable Market and Existing Products:

While anti-bacterial phone protective products are an established market, Nanoveu believes its antiviral nanotechnology has the potential to be a market leader for phone cases and screen protectors through innate antiviral properties.

Other commercially available antiviral products require repeated UV light treatment applied by the user, which is time intensive and can only offer temporary results.

While estimates vary, Nanoveu believes the mobile screen protection market represents a substantial opportunity, perhaps, offering strong potential for the new antiviral products.

Path to Market:

Production:

Nanoveu has produced 12 screen protector prototypes. These prototypes will be subject to additional testing in product effectiveness trials in Singapore and the United States.

Nanoveu is investigating the potential mass production for a variety of different phone shapes and sizes utilising Nanoveu's existing supply chain to accelerate product development and production to reduce the time typically required to bring a new product to market.

Procurement for the first production run is underway for smartphone and tablet protective screens.

To complement the screen protectors, Nanoveu is developing a protective case providing protection to the back of a phone. The case design is intended to be a conventional protective case layered with the same material as the screen protector.

Both the screen protector and case are expected to be available for sale in late Q2 2020 / early Q3 2020.

Regulatory approval:

Nanoveu has appointed consultants to advise and guide Nanoveu on compliance with the Australian Therapeutic Goods Administration (TGA).

The TGA is part of the Australian Government Department of Health, and is responsible for regulating therapeutic goods including prescription medicines, vaccines, sunscreens, vitamins and minerals, medical devices, blood and blood products.

Nanoveu will submit an application for approval to the TGA as a Class I Medical Device, which has a two day approval period.

Sales:

Nanoveu believes its antiviral nanotechnology may have a very rapid commercialisation schedule, with initial pre-orders targeted as early as late in Q2 CY2020.

Further, Nanoveu is investigating several pathways to market, which may involve establishing a critical mass of pre-orders prior to the planned release of the product.

About Nanoveu's Antiviral Nanotechnology:

This antiviral nanotechnology has been developed using active copper-based nanoparticles which have been dispersed throughout a translucent surface. The surface is currently capable of maintaining up to 90 percent visible light transparency with a hardness level of 2H.

The copper ion particles react with atmospheric oxygen – that is ordinary air around us – to produce a redox reaction. The redox reaction activates oxygen molecules to act as free radicals, which are highly effective agents at killing microorganisms and smaller organic structures, such as viruses.

The copper-infused anti-viral technology is placed over PET and hybrid glass surfaces, permitting the creation of an antimicrobial screen and clear plastic case suitable for smartphones.

The structure of how the antiviral technology is applied to a screen protector is highlighted in Figure 1.

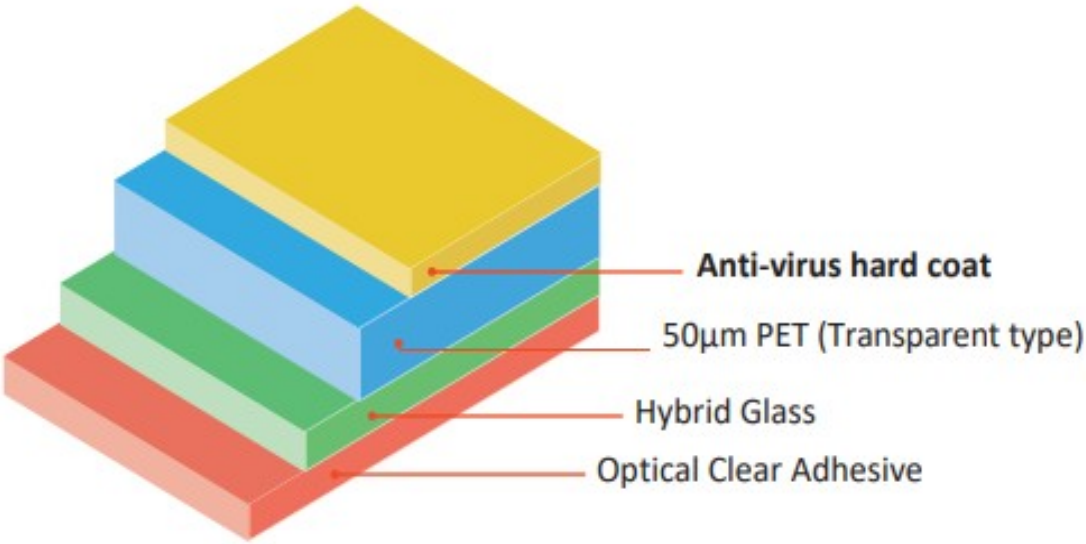

Figure 1: Product composition

Technology Certification:

Initial JIS Z 2801 validation testing of components of Nanoveu's antiviral nanotechnology were conducted by the Food and Drug Safety Centre at Hatano Research Institute, a respected Japanese safety-testing organisation, under ISO and Good Laboratory Practice (GLP) conditions.

The JIS Z 2801 test method involves covering the antimicrobial film in a solution containing various virus strands and bacteria. This test method is designed to quantitively test the ability to inhibit growth or kill microorganisms. The JIS Z 2801 (Japanese) procedure has been adopted as an International Organisation for Standardisation (ISO) procedure, ISO 22196.

In each of the scenarios, viruses and bacteria were reduced by more than 99.99% in under 15 minutes.

For these tests 0.1 mL of virus/bacteria solution was dropped into a 5cm square test specimen of both treated and untreated control specimens and covered with 4cm square film. The test specimen was allowed to stand for a specified time. After incubation, the virus test was performed on the test specimen and the virus count measurement made.

Figure 2 presents the results of testing of viruses on the antiviral nanotechnology using Mesh Tech in-house method: Conforming to JIS Z 2801: 2012 standards. The graphs show the detectible viruses and bacterial on the antiviral nanotechnology rapidly reduce.

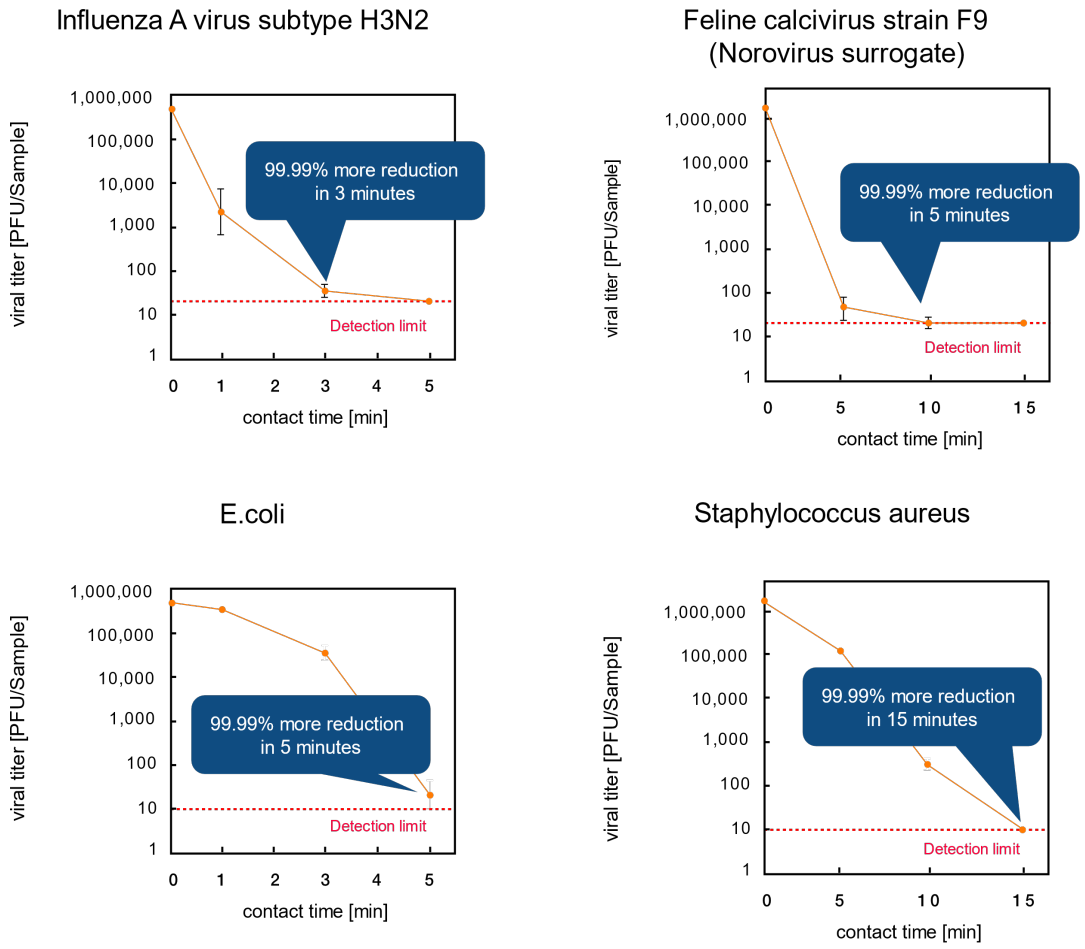

Figure 2: Results of testing of viruses and bacteria using JIS Z 2801: 2012 standards

Further details of the testing performed are included in Appendix 1.

Nanoveu is conducting further anti-viral testing by independently operated laboratories in Singapore and in the United States which will test prototype screen protectors.

The testing in Singapore and in the United States is scheduled to be performed and completed in May 2020. This additional testing will be performed on prototypes of screen protectors and is expected to provide additional results to the component testing performed to date.

The additional testing will also address the risk that the already tested anti-viral hard coat's effectiveness against bacteria and viruses is negated during the production process.

Anti-bacterial vs Antiviral:

Anti-bacterial products are a mature segment of the phone protection market, with several existing products available. However, the antiviral market remains comparatively untapped.

Bacteria are ubiquitous living cells, some of which can have the ability to form pathogens which are dangerous to human health. Alternatively, viruses are considerably smaller infectious agents which search for human and animal cells to act as a host for reproduction. Most viruses have a pathogenic relationship with the host.

Both the size and nature of viruses mean anti-bacterial technologies are ineffective at killing the infectious agent, despite the ability for viruses to pose substantial risks to human health.

A key challenge for health-related phone covers are the technical hurdles required to be effective against viruses, compared with the simpler process of killing bacteria.

Nanoveu's strong nanotechnology IP places it in a strong position to deliver a revolutionary solution for anti-viral and anti-bacteria protection products, expanding its existing product range.

History of Nanoveu's antiviral nanotechnology:

Concurrently, Nanoveu called on collaborators for Nanoveu's 3D product and Vision Correction project to assist finding complementary products for Nanoveu, including antiviral technologies. This led to the development of a resin to combine ionized copper to be incorporated into as an antiviral protective layer including a process to layer the copper material onto simple PET or film.

Forward Looking Statements: Statements regarding plans with respect to Nanoveu's outlook are forward looking statements. There can be no assurance that Nanoveu's plans will proceed as expected and there can be no assurance that product sales will eventuate as intended.

- Ends -

This announcement has been authorised for release by Nanoveu's Executive Chairman and CEO.

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About Nanoveu:

Nanoveu's flagship EyeFly3D™ product converts 2D digital displays into 3D without the need for 3D glasses. EyeFly3D™ has won numerous industry awards and is currently available for Apple iPhones and Google Pixel 3 phones.

Nanoveu is expanding its product range with the development of three complementary technologies:

- EyeFyx, to enable people with age-related farsightedness (presbyopia, one of the most common types of vision loss, affecting nearly one-quarter of the world's population and anyone living beyond middle age) to read smartphones and tablets without wearing reading glasses;
- Anti-reflective protectors, reducing screen reflection for smart phones and tablets; and
- Antiviral protectors, protecting smart phone and tablet users from viruses and bacteria.

Further, Nanoveu offers laminating machines for precise and bacterial free installation of its products on smart phones.

Appendix 1: Anti-viral and anti-bacterial performance test of anti-viral film

Purpose and Overview:

To evaluate the antiviral and anti-bacterial performance of antiviral film.

Method:

Antiviral test

The evaluation of antiviral performance was carried out with reference to ISO 18184.

Viruses used for evaluation:

- Influenza virus (H3N2) A/Kitakyusyu/159/93
- Feline calicivirus (F9 strain)

Steps in the test:

1. Anti-viralfilm was cutinto 5 x 5 cm pieces.
2. 100 μL of the virus suspension was dripped onto the sample film and covered with a 4.4 cm cover film.
3. At 25° C, influenza was incubated for 1, 3, or 5 minutes, and feline calicivirus was incubated for 5, 10, or 15 minutes.
4. The surface of the specimen was washed with medium containing surfactant.
5. The virus titer (virus count) in the above washing solution was measured by plaque test.

The effect of themonovalent copper compounds on the concentration was examined.

Anti-bacterial test

The evaluation of antiviral performance was carried out with reference to JIS Z 2801.

Bacteria used in the evaluation:

- E. coli
- Staphylococcus aureus

Steps in the test:

1. Anti-viralfilm was cutinto 5 x 5 cm pieces.
2. 100 μL of the bacillus was dripped onto the sample film and covered with a 4.4 cm cover film.
3. At 35° C, E. coli was incubated for 1, 3, and 5 minutes, and Staphylococcus aureus was incubated for 5, 10, and 15 minutes.
4. The surface of the specimen was washed with medium containing surfactant.
5. The number of live bacteria in the above washout solution was measured by the blending culture method.

Results:

Please see Figure 2 for graphs of the results.

Antiviral test

The antiviral film reduced influenza virus (H3N2) by more than 99.99% in 3 minutes.

Against feline calicivirus, it was reduced by more than 99.99% in 5 minutes.

The viral titers per contact time and the rate of decrease from the initial values obtained for each antiviral test are shown in Table 1.

	Influenza virus			**Feline calicivirus**	
Inoculation time	**Viral infectivity titer log (CFU/sample)**	**Reduction rate**	**Inoculation time**	**Viral infectivity titer log (CFU/sample)**	**Reduction rate**
0min.	5.65	-	0min.	5.47	-
1min.	3.32 +/-0.41	99.36%	5 min.	1.66 +/-0.26	100.00%
3min.	1.50 +/-0.14	>99.99%	10 min.	1.30 +/-0.00	>99.99%
5min.	1.30 +/-0.33	>99.99%	15min.	1.30 +/-0.00	>99.99%

Table 1: Viral titers and initial reduction from contact time for each antiviral test

Anti-bacterial test

The antiviral film reduced E. coli by more than 99.99% in 5 minutes. In addition, for Staphylococcus aureus, it was reduced by more than 99.99% in 15 minutes. The number of live bacteria per contact time and the rate of decrease from the initial value obtained in each antimicrobial test are shown in Table 2.

	E. coli			**Staphylococcus aureus**	
Inoculation time	**Number of live bacteria log (CFU/sample)**	**Reduction rate**	**Inoculation time**	**Number of live bacteria log (CFU/sample)**	**Reduction rate**
0min.	5.66	-	0min.	5.47	-
1min.	5.51 +/-0.04	28.44%	5 min.	5.05 +/-0.05	61.49%
3min.	4.22 +/-0.13	0.9622	10 min.	2.56 +/-0.25	0.9986
5min.	1.24 +/-0.33	>99.99%	15min.	1.00 +/-0.00	>99.99%

Table 2: Number of live bacteria per contact time of each antimicrobial test and rate of decrease

Dates Tests Were Performed:

- E. coli: 24 January 2018
- Influenza virus: 24 January 2018
- Staphylococcus aureus: 5 February 2018
- Feline Calicivirus: 9 February 2018