The webinar will start at 4:00 PM (KST).
Kindly turn off your mic and webcam so as not to interfere with the speakers and the moderator.
WeGO Network

205 Members
154 Local Governments + 32 Corporations + 19 Institutions

Partners
Smart Solutions, Videos & Webinars, and Need Assistance?

**VIDEOS & WEBINARS**

This section highlights upcoming webinars that p&g and its partners are organizing to share successful practices and best practices that other governments have used to fight the ongoing crisis.

**Upcoming Webinars**

- **Digital Technology & the COVID-19 Pandemic**
  - By: UCSF, University of California, San Francisco
  - April 15, 2020

- **NEED ASSISTANCE?**

  This page lists companies in Korea that manufacture medical supplies related to addressing COVID-19. If your city needs assistance in getting medical equipment and have any other COVID-19-related requests, please contact these contacts through the following:

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<tr>
<th>No.</th>
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**Video Archive**

- **Coronavirus Success**
  - By: TheSG
  - April 14, 2020

- **Singapore's Coronavirus Success**
  - By: TheSG
  - April 14, 2020

- **Korea on Fastening the Curve**
  - By: TheSG
  - April 14, 2020

**Webinar Archive**

  - By: TheSG
  - April 14, 2020

- **COVID-19 Precaution Tips for Individuals & Organisations**
  - By: TheSG
  - April 14, 2020
Opening Remarks

Won-Soon Park
Mayor of Seoul and President of WeGO

Abigail S. Binay
Mayor of Makati

Andy Foster
Mayor of Wellington

Kyong-Yul Lee
WeGO Secretary General
Speakers

Dr. Baeg-Ju Na
Director of Civil Health Bureau

Dr. Methipot Chatamethikul
Director of Communicable Disease Control Division
Bangkok Metropolitan Administration

Viktor Fersht
Member of Council for Digital Vladivostok

Dr. Lanfranco Marasso
Smart City Program Officer of Engineering Ingegneria Informatica SpA

Chris Georgiev
CEO of Imagga

Dr. Ogan Gurel
Chief Medical Officer at Psomagen (Visiting Professor at Daegu Gyeongbuk Institute of Science & Technology)
Welcome Message

Won-Soon Park
Mayor of Seoul
Special Message

Abigail S. Binay
Mayor of Makati
Special Message

Andy Foster
Mayor of Wellington
Opening Remark

Kyong-Yul Lee
WeGO Secretary General
Korea’s Rapid Response and Preparedness

Dr. Baeg-Ju Na
Director of Civil Health Bureau
‘Transparency is a miracle drug for contagious diseases,’ and ‘Excessive response is better than sluggish response.’
The global COVID-19 pandemic has been a wake-up call for us to realize that we are all living together on one planet. Virus knows no border and we can rest assured that no country or city is immune to the virus. Our cooperation beyond borders is the only option to take in this unprecedented epidemic crisis brought by coronavirus.

The city of Seoul, therefore, would like to share our principles for disease control and prevention, experiences and know-how with the international community on this webpage in the hope that it will offer a glimpse of hope to global cities that are stricken hard by the
Disinfections & Tracing

CLEAN ZONE
[Disinfection Completed]
This facility has been disinfected by the city of Seoul.

CLEAN ZONE
[Disinfection Completed]
This facility has been disinfected by the city of Seoul and performs additional disinfections regularly.

Emergency Text Alert
2020/05/24 15:01 Seongdong-gu
Visitors to "Illuori" in Seongsu 2-ga 3-dong (40, Seongsu-il-ro 8-gil) from Tue, May 12 to Thu, May 21 encouraged to get tested for COVID-19 at Seongdong-gu public health center regardless of
PICTURE 5. Officials at Seoul ward offices checking addresses (Left) and packing masks (Right) to deliver masks to pregnant women who have difficulty going out amid the spread of COVID-19. (Source: Yonhap News Agency)
Financial Support

Emergency Livelihood Allowance

Provide an emergency livelihood allowance to households who make less then 100% of the median income.

Emergency Livelihood Assistance is between 300,000-500,000 won (US$233-389)

PICTURE 8. Mayor Park Wonsoon of Seoul is announcing the government’s plan for financial support targeting the residents struck by COVID-19. (Source: Seoul Metropolitan Government)
Current Itaewon Case

Tracking
- Tracked contacts of people who visited the same facilities as those who were infected.
  - Credit card transactions
  - Contact information filled out upon entry

Customized Text Messages
- Customized text messages to those who were found to be at the facilities at the time.

Stricter Measure
- People who do not voluntarily get tested when they should, could be subject to a fine up to 20 million won.
Preparedness

Seoul Standard Preventive Measure Model for Epidemics

- Strengthen infrastructure and groundwork in responding to outbreaks of infectious diseases on the local government level;
- Build up on medical resources for preventive measures against epidemics;
- Establish response system in preparation for a second wave of the pandemic.
Seoul will categorize infectious disease response into 7 levels.

Newly establish a research center for infectious diseases and an epidemiological investigation office.

Innovate and strengthen our public health systems and services.
04. Expand on its public health workforce to provide better public health services and respond more efficiently to pandemics.

05. Build “Seoul’s Ark,” an integrated warehouse to stock up disaster management resources.

06. Expand on and strengthen the function of designated public clinics.
Seoul Standard Preventive Measure Model for Epidemics

The rapid, innovative, and transparent preventive measures that Seoul took, together with systemized citizen participation, was what made Seoul an exemplary case in preventing the spread of COVID-19.

THANK YOU
Bangkok COVID-19 Website

Dr. Methipot Chatamethikul
Director of Communicable Disease Control Division
What is BKK COVID?

DR. METHIPO CHATAMETHEEKUL

It is the website to help screening, educate and help people to receive advice and treatment correctly and instantly. Which people can do risk assessment by themselves on the website http://bkkcovid19.bangkok.go.th/, which uses the PUI criteria as well as doctors used to ask initial symptoms in order to screen people at risk of being infected with covid-19.

1. Evaluate risk history, including traveling from areas with ongoing outbreaks, get in touch with people from outbreaks, close contact with patients that are within the scope or have been confirmed to have a covid-19 infection or traveling to risky areas within the country.

2. Assess the body temperature or history of fever.

3. Assess the respiratory symptoms such as cough, runny nose, sore throat and shortness of breath or difficulty breathing.
When the assessment is completed, the system will assess and classify to be at risk level. Along with giving knowledge on how to behave according to the risk level, such as:

Group 1, no risk history group (green) will receive basic self-care recommendations by "washing hands frequently, having hot food, personal spoons, wearing masks, keep away from others, exercise and get enough rest."

Group 2 Surveillance group (yellow) may have other diseases such as cold, influenza. Observe symptoms in 48 hours. If symptoms do not improve, should consult a doctor and receive advices from health personnel.

Group 3 At risk (orange) will be advised for themselves and their close ones. And keep record data to contact staff in the system. After submitting contact information in the system BMA staff will call if selected as a suspect case, make appointment (date, time, location) to take specimen for Covid-19.

Those in the risk group, follow the instructions for 14 days as follows: Stop activities include studying, working, and should separate bedroom, eating, bathroom (if possible), wearing mask, washing hands frequently, do not share personal belongings with others. Keep distance from others. Cover the nose with tissue every time when cough or sneeze. Regularly clean toilets, accommodation, disposable items, disposed used mask by putting in a sealed bag. Regularly observing fever, cough, sneezing, nasal discharge, sore throat, difficulty breathing if the temperature is 37.5 degrees celsius or more and with wheezing inform the staff instantly.

The system will arrange health staffs to give knowledge and assess symptoms every day for 14 days for those close to risk groups.

All residents of the house should wash their hands frequently, avoid close contact and should sleep separately with those at risk.

http://bkkcovid19.bangkok.go.th
When being close to people in high-risk groups, wear a surgical mask. And with a distance of 1-2 meters.

Regularly clean clothes, bed sheets, towels or others with ordinary detergent and water. Clean the accommodation with 70% antiseptic or alcohol and protect with gloves, masks, Face shield along with observing their illnesses for 14 days after close contact with those in risk groups and group 4, suspicious (red) groups, wear a mask confine yourself to the house immediately and should see a doctor for a diagnosis. By recording information to contact staff in the system or contact by telephone, such as the Erawan Center Bangkok EMS: call center 1646 or the National Institute of Emergency Medicine: call center 1669.

If the assessment officers are in the group that must be examined urgently the system will arrange an ambulance from the Erawan Center Bangkok EMS to come to the hospital and test for Covid-19. As soon as possible
Digital Technologies at Pandemia COVID-19

Viktor Fersht
Member of Council for Digital Vladivostok
Digital Life in Self-Isolation and Quarantine COVID-19
Vladivostok experience

Viktor Fersht
Aleksandr Latkin
Vladivostok is the capital of the Russia Far Eastern Federal District. Here are the headquarters of the Representative of the President of the Russian Federation, all ministries of the country, the largest Far Eastern Federal University in Russia.

Vladivostok was the first in Russia to completely rebuild its digital management and online activity under strict quarantine against the coronavirus COVID-19.
Russian digital programs against COVID-19 in Vladivostok
We are Together
https://we.together2020.rf/

Mutual assistance action We are together works for supporting elderly, disabled citizens and medical staff during the coronavirus pandemic. Volunteers work in all regions of Russia, delivering medicines and products. Lawyers and psychologists give free advice to those in need of their help, and thousands of participants of the We are Together help with their services and goods.

This program We are together also work for Assistance to compatriots who are abroad and want to return to native country

Currently, export flights are being organized for Russian citizens who are ready to return to their homeland.

Often people stay in different countries due to the fact that they are not taken on flights to cities that do not coincide with the place of registration. If somebody find himself in this situation, We are Together helps him get on the next flight to Russia and return home.
Russian public movement “WE” is a digital action that allows NGOs participate at Russian governmental project “Digital Economy”. We movement combined many aspects of activities into the virtual life of Russia and whole World.

Public movement “WE” united leaders and activists of various NGOs, active and caring people for creation socially significant events on the platform.

Best projects of WE digital movement receive grants of Russian government and president of Russia.
The Institute of Automation and Control Processes of the Russian Academy of Sciences, together with Chinese universities, created an artificial intelligence platform for the diagnosis and treatment of coronavirus using eastern medicine methods.

The platform works in English, Russian and Chinese.
These projects differ from various similar projects by their multilingual option. All these projects do not use English as international language for communication among project participants.

These projects use artificial intelligence translators to communicate.

All participants communicate in their native language, and artificial intelligence automatically translates their communication online.

We believe that the future on the Internet is not in the using of English language as intermediate communicator tool, but in the simultaneous translation of artificial intelligence.
This is the first multilingual project that combined different national messengers with automatic translation into their native language. The person who wants to convey his empathy, sympathy and support to another person can communicate with him in his native language. It gives everybody chance even being in another country and not knowing any foreign language or English language as international.

Mutual empathy sessions can be conducted online or by telephone. Mutual empathy groups can be used in KakaoTalk, WeChat, Line, Skype, WhatsApp, Facebook.

Program also use multilanguage platform Lark https://www.lark.com - a New Kind of Compassionate Care for Chronic Diseases.

Lark uses the power of Artificial Intelligence and proven Cognitive Behavioral Therapy to drive behavior changes that help people manage or avoid costly chronic conditions.
Multilingual project for international online dispute resolutions in Asia Pacific

In conditions of isolation of clients from law offices caused by COVID-19, project can arrange their meetings in foreign countries via video conferencing.

For this purpose is using the multilingual platform lark at www.larksuite.com.

The artificial intelligence of the Lark platform can translate the communication of people who do not know foreign languages from English, Russian, Chinese, Japanese and Korean to their native languages.

Now clients can communicate with their lawyers without leaving their apartments and avoiding assistance of interpreter or translator.
Virtual Learning - Multilingual Platform

University of Vladivostok, together with UNESCO and a number of universities in the North-East Pacific Ocean, have created a Coordination Committee for international online education.

Main difference of this program from other such projects is in using of native language for education process based on international programs. Every schoolchildren or student communicate with teacher abroad with automatic translation of artificial intelligence.

Committee invites universities and schools of the Asia-Pacific countries to join the project of multilingual platform with the translation of artificial intelligence into the native languages.
Vladivostok will take part in the videoconference World Artificial Intelligence in Healthcare 2020 - "Intelligent Connectivity, Shared Health". The conference will be held on July 11, 2020.

The conference will discuss the health issues of smart cities in the Asia-Pacific region and other countries of the World. Conference organized by Chinese NGO and Chinese Government

Welcome to participate with us!

You can register at the web site of International Medical Exchange and Cooperation Committee (IMECC)
Suggestion to discuss North-East Asia-Pacific “Smart Cities”

Vladivostok proposes to hold a conference for launching of Smart Cities Association of the North-East Asia Pacific Region. Vladivostok could be a host of this Conference at the end of 2020 or at the beginning of 2021.

Vladivostok also suggests to organize an online video conference to prepare Organizing conference of Smart Cities Association of the North-East Asia Pacific Region at this summer.
Our contacts:

Russian Far East Virtual Network of Smart Cities
https://fersht.wixsite.com/mysite

E-mail:

mind.q@yandex.ru

Viktor Fersht
Aleksander Latkin
The Integrated Bio-surveillance Platform

Dr. Lanfranco Marasso
Smart City Program Director, Engineering Ingegneria Informatica SpA
Can data save lives? YES, absolutely!

DE4Bios, the integrated Bio-surveillance platform for SARS-CoV-2.

Lanfranco Marasso, Ph.D.
Engineering Ingegneria Informatica SpA
Smart City Program Director
SARS-CoV-2 is the worst health crisis of our times
Pandemic impacts

- **Extreme stress on healthcare systems:** difficulty of healthcare structures (especially, intensive care units) to hospitalize all infected subjects and on getting health workers back to work safely
- **Global economic recession:** slump in demand, rising unemployment and consequential depressive economic loop
- **Stop of social life:** over 1 billion people closed in homes and more than 770 million students unable to attend school
- **Increase in social inequalities**
Challenges to face

- **Stop** contagion
- **Lower death rates**
- **Control** the spread of the epidemic
- Enable **health personnel** to work safely
- Creating a **New Normal**: a social life characterized by new safety **rules of behavior** that can protect our health
- Restart all **economic and productive sectors** ensuring **worker safety**
- Promote the restart of the **global economy** to create new liquidity and increased demand
How to Stop Contagion: Social Distancing

Firstly, in order to stop the virus, implementing social distancing rules is necessary to guarantee that people maintain a distance of at least 1 meter ("droplet" distance criterion) between each other.

Imperial College’s Covid-19 Team estimated the impact of this type of intervention on the spread of contagion in 11 European countries, demonstrating that:

- It decreased the number of replications (on average between countries) by 64% compared to the pre-intervention value
- It avoided around 60,000 deaths so far
How to Stop Contagion: Monitoring

The aim to contain the pandemic and its spread must be supported by continuously monitoring the spread of the virus, in order to:

- Locate positive subjects
- Identify clusters
- Map the areas of the infection
- Activate containment actions
- Predict the evolution of the epidemic
- Control the effectiveness of the containment measures
Creating an Ecosystem

To successfully stop the spread of SARS-CoV-2 through monitoring, it is necessary to create an ecosystem that relates:

- Institutions
- Healthcare organizations
- Central healthcare services
- General practitioners
- Civil Protection
- Organized volunteer structures
- Law enforcement
- Citizens
Biosurveillance

It is the **process of collecting, integrating, interpreting and communicating** essential information on threats, dangers or diseases affecting human, animal or plant health. **Optimizes the decision-making process** in emergency situations, creating **databases** on which to carry out:

- Real-time **geolocation** of clinical-health phenomena
- Construction and application of **epidemiological models**
- **Predictive contagion maps**
- Remote **health surveillance** tools.
- **Advanced Data Analytics.**
«Agile» thanks to FIWARE
What is it?

Eng-DE4Bios is our biosurveillance platform, that enables to monitor the evolution of the epidemic, to map and geolocate infected subjects and to identify clusters requiring higher attention.
What does it do?

The platform, already active in Italy, represents an active bio-surveillance model that can:

- **define restricted user clusters** (State, Regions, Cities, etc ...)
- **define subjects' health profiles** (positive / negative)
- **identify the network of social relationships** (family, work, neighbors, school) that may expose a citizen to contagion
- **predict onset of clusters** that require higher attention.

Eng-DE4Bios is based on Digital Enabler, our ecosystem platform that allows to **integrate, harmonize, correlate and visualize** scattered and multi-source data.

The Digital Enabler is powered by FIWARE
How does it work?
Where do we apply it?

Eng-DE4Bios serves the purposes of various actors involved during a healthcare emergency, as it provides:

- **general practitioners** a view of their patients, who has been tested, and a tool to appropriately approach patients

- **occupational doctors** with real-time indicators of Covid-19 cases, a view on workers tested, recording of test results carried out by the business, a tool to apply the correct protocols and safely approach work activities

- **operators of healthcare organizations** with indicators on epidemic evolution, a georeferenced view of tests, their outcome and the analysis of family, residence and work context of the examined subject, a view on workforce, and monitor clusters at risk

- **members of Task Force / Regional Crisis Unit** with a view to monitor real time the epidemic and carry out epidemiological simulations, identify risky clusters, a georeferenced view of tests, aggregated positive cases and status of regional structures.
Can data save lives? Yes!

- **Informs**, in real time, on the status of the infected population (infected, healed, immunized, deceased, hospitalized, hospitalized in intensive care, in home isolation)
- **Monitors** the spread of the virus among health workers (infected operators, isolated operators), highlighting the decrease or increase of the workforce
- **Provides** a relation-based service that, if a subject is tested positive, identifies subjects who are likely to be infected among members of the same family and domiciled at the same address
- **Identifies** clusters at risk (nursing homes, families, workplaces) to be screened and subject to forms of preventive isolation
- **Provides** a service that, if a subject is tested positive, identifies whether the subject is a worker and / or student, the data of the employer / school, other addresses and contacts to identify clusters of likely infected people.
Towards «New Normal»: predict new clusters
Analyze operational and territorial contexts (1/2)

It aims to define:

- **List of Institutions** that make up the governance and territory ecosystem
- **Map of relationships** and operational dependencies
- **Definition of pre-emption levels** on shared information if duplicated by different Bodies
- **Level of automation** of each Institution and the ability to exchange information with third parties, how often and with which formats.
- **Determination of an index of accuracy / updating** of the information held and subject to potential exchange
- **Reference population** (audience)
Analyze operational and territorial contexts (2/2)

This phase is designed to define the number of operators who must have individual access to the platform, role and access privileges:

- Family doctors and pediatricians
- Local Health Units’ Operators
- Operational management task force staff
- Supervisors of operational emergency organizations (Civil Protection)
- Law enforcement officers
- Government representatives of regional and local structures
- Representatives of the Service Centers delegated to the provision of territorial IT Services
- Other subjects represented
Analyze the coverage level related to the data model

This phase relates to the analysis of the coverage level with respect to the data model defined by the Biosurveillance Platform.

This evaluation ensures the possibility of having a minimum and necessary level of alignment on the key data represented and managed by the platform.

In their absence, it is necessary to provide for ad hoc integrations: either by developing new data extractors or by manually collecting and feeding key information flows.

For this purpose, the specifications relating to the key datasets used by Eng-DE4Bios platform are made available to technical operators. These allow to determine the level of initial compatibility with respect to the system requirements, using appropriate check-lists.
Analyze the coverage level related to the data model: benefits

The information processed is therefore useful in determining:

• **Structural information deficiencies** that could delay the adoption process

• **Possible progressive** use of different data sources

• **Recommended methods** for integration: through the development of ad hoc dynamic queries or by fully exporting the necessary information on the platform

• **Estimated time** to commission the system

• **Overall commitment** required to complete the activities and total operation of the system.
Security aspects

- The service platform was subject to **Security Audit** to detect vulnerabilities, weaknesses, exposures and anomalies of the solution proposed in the reference architectural and operational context.

GDPR regulatory aspects

Some significant impact actions have already been natively envisaged in the overall architecture of the Platform such as, for example, **data encryption** residing on the DB with asymmetric keys, **access to data according to restrictive 'role-based' principles**, the management of web interfaces and data exchange through **secure protocols (SSL)**, user **authentication and profiling** according to the **recommended guiding principles**.
### Dati per Microbiologia

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## OPERATORI SANITARI

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<td>6</td>
<td></td>
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<td>15</td>
<td>247</td>
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</tbody>
</table>

### SUGGERIMENTI
Osservare e registrare le azioni su dispositivi e linee assortite sulle maschere.
Lanfranco Marasso, Ph.D.
Engineering Ingegneria Informatica SpA
Smart City Program Director
lanfranco.marasso@eng.it
AI Remote Thermal Monitoring

Chris Georgiev
CEO of Imagga
AI REMOTE TERMA MONITORING AND DIAGNOSTIC ASSISTANCE
Kelvin is a non-invasive AI-powered platform which allows you to daily monitor your body for early and hidden signs of various thermally verifiable diseases.
Never done before

Cross-field innovation between medical science, thermography and AI

Off-the-shelf mobile health monitoring assistant

Based on automated AI-powered imaging analysis

For non-invasive and non-destructive screening and monitoring at home

Constantly improved through Big Data Machine Learning
Kelvin Platform

1. Thermal camera
2. AI Analysis
3. Medical cross-check
4. Preliminary results

Thermal camera
Take a thermal photo of your upper body four times a day
AI thermal analysis
Performing a AI analysis of the thermal picture

1. Thermal camera
2. AI Analysis
3. Medical cross-check
4. Preliminary results

Thermal picture AI analysis
Mapping the POI based on the trained ML model

Analysis of the POI
After mapping - defining boundaries of discrepancy with the underlying data.

Analysis of the identified discrepancies
between the input of shooting + ML model for comparison.
Kelvin Platform

1. Thermal camera
2. AI Analysis
3. Medical cross-check
4. Preliminary results

Medical analysis
Comparing the collected visual and medical information.

Amendment analysis
Performing a direct analysis of the overall change in the parameters of the POI.

Medical analysis
Comparing the collected medical information for viral disease to the Amendment Analysis results.

Identifying Anomalies
Calculating the probability of having a Viral Infection and spotting the location, based on the Medical Algorithm.
Kelvin Platform

1. Thermal camera
2. AI Analysis
3. Medical cross-check
4. Preliminary Results

Preliminary Infection Results
Establishing a general preliminary diagnostic evaluation based on a series of recordings.

* Results are formed on the basis of a medical algorithm and mathematical calculations

* Provide information about the percentage probability of a viral infection in the body

* Help in assisting of the timely detection of a progressing infection process.
Kelvin App

- Thermal Images
- AI Analysis
- Schedule
- Analytics
- Telemedicine

- Personal Alerts
- Android and iOS
- Anonymity
- Monitoring
- 24/7 Support
Target groups
✓ Infected patients under home quarantine
✓ Not infected but quarantined patients
✓ Risk groups (elderly, chronic cardiovascular and respiratory diseases, diabetes)

Benefits
✓ Alerts 1-3 days before conventionally felt symptoms and prevents premature or delayed hospitalization
✓ Monitoring of quarantined patients
✓ Centralized management and localization of infection outbreaks
Long-term Applications

Respiratory diseases
Monitoring of active inflammatory diseases of upper and lower airways/chest.

Vascular diseases
Longitudinal (ambulatory) monitoring of diagnosed and staged vascular diseases.

Oncology diseases
Longitudinal (ambulatory) monitoring of diagnosed and staged oncology diseases.
Social and healthcare system benefits

- Preventing risk stratification regarding deaths of people left for home treatment with sudden complications
- Significant reduction of healthcare costs avoiding unnecessary hospitalisations
- Objective snapshot of the health condition of population
- Minimising loss of efficiency and days of work missed
Benefits for Local Governments

✓ Domestic monitoring for early detection of selected thermally verifiable diseases

✓ Non-invasive remote monitoring solution

✓ Cost-efficient tool for health status monitoring of public workers (transport, tourism & culture, elderly care, etc.)

✓ Statistical data re-use for public bodies and stakeholders
Kelvin Roadmap

Q1-Q2’2020
- Initial trials and cross-check with X-ray ML model (100K+ images)

Q3-Q4’2020
- Thermal image processing AI and ML models in active development
- iOS (TestFlight) and Android applications for data collection
- Access to hospitalised patients and ongoing medical trials
- Negotiating with thermal camera manufacturers
- Identify public sources of funding
- Q1-Q2’2020
- Q3-Q4’2020
Connecting the dots

+ Large-scale clinical trials and extended regulatory compliance
+ Massive data collection and improvement of AI accuracy
+ Partnering with thermal camera suppliers
+ Refinement of business model and commercialisation strategy (post COVID-19 pandemic)
One of the pioneers and global leaders in computer vision A.I.

Invited speakers at events like GTC, CEPIC, DMLA, BAPLA

4 place winner at K-Startup Grand Challenge 2016 (NIPA)

Top Technology in Precision and Recall

Has trained possibly the largest image classifier in the world containing 320K+ classes and used in PlantSnap - the top-5 best seller on the App Store for 2018

Top 3 in precision and top 1 in recall in an independent Israeli evaluation of the leading image tagging solutions*

*Source: https://arxiv.org/abs/1903.09190
Readiness Advice from the Medical Community

Dr. Ogan Gurel
Chief Medical Officer of Psomagen
Readiness Advice from the Medical Community

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29 May 2020
What do we know about this virus?

How can we stop it?

How does it cause disease?

What are the prospects for a vaccine?

Can one be “reinfected”?

How does one test for Covid-19?

Do antibody tests work?

Does the virus mutate?

Are effective antivirals possible?

And other questions …
Scientia potentia est
Some Knowledge is power

Sir Francis Bacon
1561 - 1626
The Virus Enemy

Epidemiology: Mortality & Transmission

The Virus Attacks

We Fight Back

The Virus Spreads

What Is To Be Done?
The Virus Enemy

Epidemiology: Mortality & Transmission

The Virus Attacks

We Fight Back

The Virus Spreads

What Is To Be Done?
What is a virus?

- Genetic material
- Contained within an organic particle
- That invades living cells and
- Uses the host’s metabolic machinery
- To produce new virus particles

Are viruses alive???
The Virus: SARS-CoV-2

1. **Nucleic Acid** (genetic material)
   - **RNA** (not DNA)
     - Can mutate
     - … with implications for immunity & vaccines
     - Used for testing
     - RT-PCR test

2. **Lipid Envelope** ("grease")
   - Determines environmental viability
   - So … soap & alcohol disrupt this membrane

3. **Spike Protein**
   - Determines target
   - Blocked by antibodies
   - Also used for testing
     - "Antigen" & "Antibody" tests

Has three parts (inside to outside)
- Nucleic Acid
- Lipid Membrane
- Spike Protein

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Are Viruses Alive?

No!

There are only two ways to get rid of the virus

1. Physically destroy it

2. Cleared it by the immune system
Outline

The Virus Enemy

Epidemiology: Mortality & Transmission

- The Virus Attacks
- We Fight Back
- The Virus Spreads
- What Is To Be Done?
Generally there is an inverse relationship between transmissibility and fatality.

- More transmissible, less fatal
- Less transmissible, more fatal
Seasonal Flu vs Covid-19

More recent data suggests different numbers.
Outline

- The Virus Enemy
  - Epidemiology: Mortality & Transmission
  - The Virus Attacks
    - We Fight Back
    - The Virus Spreads
  - What Is To Be Done?
Fatality Rate (CFR) and Transmissibility ($R_0$)

- **Fatality Rate (CFR)**
  - Log scale
  - 100%
  - 10
  - 1
  - 0.1

- **Transmissibility ($R_0$)**
  - Average number of people infected by each sick person
  - Spreads faster

**New coronavirus**
- Most estimates put the fatality rate below 3%
- Number of transmissions between 2 and 4

- SARS
- MERS
- Ebola
- Smallpox
- Spanish flu
- Spanish flu
- Measles
- Common cold
- Chickenpox
- Polio
- 2009 flu
- Seasonal flu

Adapted from *New York Times*, 28 Feb 2020

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The Virus Attacks
Type II Pneumocytes & ACE2

SARS-CoV-2 infects these critical cells.
Causing Lung & Cardiovascular Disease

**CELLULAR**
Destruction of Type II Pneumocytes
- By the virus
- By the immune system

**MOLECULAR**
- ↓ACE2

**SEVERE COVID-19**
- ↓ Type II Pneumocytes
  - ↓ surfactant
- ↓ Gas Exchange
- ↑ Late-stage inflammation & fibrosis

**PATHOLOGY (Disease)**
SARS-CoV-2 “Spike Protein”
Angiotensin Converting Enzyme
- ACE1: ↑ BP
- ACE2: ↓ BP & ↓ Inflammation

Type II Pneumocyte
[But also on other cells throughout the body.]
Beyond the Lungs

Impaired Gas Exchange
Need a ventilator

May be related to late-stage
- Immune damage
- Blood pressure collapse
- Drug toxicity

Diarrhea
Fecal-oral transmission?

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# Symptoms of Covid-19

<table>
<thead>
<tr>
<th>COVID-19</th>
<th>Flu</th>
<th>Allergies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Fever</td>
<td>Sneezing</td>
</tr>
<tr>
<td>Cough</td>
<td>Cough</td>
<td>Nose: Itchy, running or blocked</td>
</tr>
<tr>
<td>Shortness of Breath</td>
<td>More upper respiratory tract</td>
<td>Eyes: Itchy, red, watering</td>
</tr>
<tr>
<td>Sore throat</td>
<td>Sore Throat</td>
<td></td>
</tr>
<tr>
<td>Loss of smell (anosmia) or taste</td>
<td>Fatigue (Malaise)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Headaches</td>
<td>Body Aches</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More generalized symptoms</td>
<td></td>
</tr>
<tr>
<td>2 – 14 days after exposure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How Important is Viral Load?

- ΔCT (DCt): # of PCR cycles to become positive
- ↓ DCt = ↑ virus

Nasal Swab test
PCR reaction to detect viral RNA

Amount of exposure is probably a key factor

Lancet, 19 Mar 2020

More virus

Dr. Li Wenliang
1986 – 2020 (Age 33)
The Virus Enemy

Epidemiology: Mortality & Transmission

The Virus Attacks

We Fight Back

The Virus Spreads

What Is To Be Done?
How Do We Fight Back?
The Secondary Response is Stronger

Not just antibodies (humoral) but also cell-mediated immunity has an enhanced secondary response.
Boost Your Immune System!

- Get enough sleep

- Update your vaccines
  - Seasonal flu vaccine
  - Pneumococcal vaccine (PCV13, etc.) for older individuals

- Healthy eating
  - Whole plant foods
  - Yogurt and other probiotics
  - Healthy fats (non-trans, unsaturated)
  - Limit added sugar
  - Improve gut microbiome
  - Decrease inflammation

- Moderate exercise (30 minutes, at least 3 times a week)

- Manage stress (meditation, exercise, walking, nature, etc.)

- Supplements?
  - Stay hydrated
  - If possible, spend time outside and get sunlight (vitamin D)
  - Take recommended dose of vitamin C (~ 1,000 mg /day)
  - .... But no evidence for mega doses.

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Is a Covid-19 Vaccine Possible?

**Good News**
- Over 40 early development vaccines
- Four in Phase I clinical trials
  - Two BCG trials (Phase II/III)
- RNA virus so likely not latent, unlike hepatitis/herpes
- Unlike HIV spares the immune system

**Bad News**
- Like the common cold, antibodies seem short-term
- Antibodies relatively ineffective
- It’s an RNA virus … so it mutates (like influenza)
- Anti-vaxx sentiment could be a barrier

We probably need a
- Polyvalent vaccine
- Multi-vehicle vaccine

This implies a multi-disciplinary, multi-company effort

So we need strong public education
**Is “Reinfection” Possible?**

**RE-DETECTION**

1. **Testing Problem**
   - Original *False Negative* (didn’t pick up small amounts)
   - Repeat *False Positive* (remnants of RNA)

2. **Latency** (dormant virus)
   - Unlikely
   - Typically seen in DNA viruses (hepatitis / herpes) or retroviruses (HIV)

**RE-INFECTION**

3. **Immune Failure**
   - Possible
   - Remember that antibodies may be weak

4. **Mutation**
   - Unlikely
   - But mutated forms of the virus seen (more on this later)

---

**News**

*Covid-19: WHO and South Korea investigate reconfirmed cases*

**Four Possible Causes**

These “reinfected” patients don’t seem to be infectious

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And Antivirals?

- Unlike “miracle” antibiotics which kill bacteria, antivirals cannot kill viruses
- One cannot kill that which is not alive

- Antivirals “slow down” the virus, allowing the immune system to clear it
- As with HIV, perhaps a cocktail of drugs will be necessary


No NIH-approved antivirals
 outlining The Virus Enemy

- Epidemiology: Mortality & Transmission
  - The Virus Attacks
  - We Fight Back

- The Virus Spreads
  - What Is To Be Done?
Fatality Rate (CFR) and Transmissibility ($R_0$)

**Fatality Rate**

- (log scale)
- 100%
- Bird flu
- Ebola
- Smallpox
- MERS
- SARS
- Spanish flu
- New coronavirus
- Most estimates put the fatality rate below 3%, and the number of transmissions between 2 and 4.

**Transmissibility**

- Average number of people infected by each sick person
- $R_0$

*Adapted from New York Times, 28 Feb 2020*
SARS-CoV-2 has an estimated $R_0$ of 2 – 2.5

**Is that correct?**

- **Basic Reproduction Number ($R_0$)**
  - Number of cases generated by one case when everyone is susceptible
    - $R > 1$ means exponential growth
    - Larger $R$, quicker spread
  
- **Effective Reproduction Number ($R$)**
  - Number of cases generated by one case in an actual population where some may be immune

- **Intrinsic Factors**
  - The nature of the virus
    - How is it transmitted?
    - How long is it viable?
    - What is the incubation period?
  - The nature of the population
    - $\beta$: Infection-producing contacts

- **Extrinsic Factors**
  - $R_0 = \beta \times \tau$
  - $\tau$: Mean infectious period

- **Social Distancing & Protective Measures (Masks)**
  - Finding, isolating, treating infectious people quickly

- **So the $R$ may decrease over time**

- **The $R$ might change with mutation**

- **So the $R$ changes with situation**
Intrinsic Factors ($R_0$) Methods of Transmission

**DIRECT**

Direct transmission means that the disease is passed directly from one infected person or animal to another person or animal.

1. PERSON-TO-PERSON
2. DROPLET

**INDIRECT**

Indirect transmission occurs when a disease is passed from an infected person to another person, even though the two people have not had direct contact.

3. FECAL-ORAL
4. AIRBORNE

**VECTOR**

Vector transmission requires another organism to transmit a disease from person to person or from animal to person. This is a type of zoonotic (animal to person) transmission, but differs from direct zoonosis, in which a vertebrate animal contracts a disease and passes it directly to a person, as with rabies.

5. FOMITES
6. INSECT BITE

Typical Transmission Methods of Various Pathogens:

- SARS-CoV-2
- HIV
- Tuberculosis
- Chickenpox
- Zika
- Lyme disease
- Ebola
- MRSA
- Measles
- Influenza
- Norovirus
- E. Coli

Adapted from National Geographic © 2020 Ogan Gurel. All rights reserved.
How long can SARS-CoV-2 be “viable” on surfaces?

<table>
<thead>
<tr>
<th>Material</th>
<th>Viable Time</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>3 hours</td>
<td>Masks &amp; isolation</td>
</tr>
<tr>
<td>Copper</td>
<td>4 hours</td>
<td>Cleaning (&amp; PPE)</td>
</tr>
<tr>
<td>Cardboard</td>
<td>24 hours</td>
<td>DROPLET PRECAUTIONS</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>2–3 days</td>
<td>CONTACT PRECAUTIONS</td>
</tr>
<tr>
<td>Polypropylene plastic</td>
<td>3 days</td>
<td></td>
</tr>
</tbody>
</table>

Masks & isolation
- Surgical mask, K94, N95, Cotton
- DROPLET PRECAUTIONS

Cleaning (& PPE)
- Soap & water
- Alcohol
- Bleach
- Hydrogen peroxide
- CONTACT PRECAUTIONS

DROPLETS

FOMITES

DROPLETS

FOMITES

*“Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1,” NEJM, 16 Apr 2020*
Extrinsic Factors ($R_0$)
Primary Mitigation Strategies

1. Intervene Fast, Before It’s a Crisis
   - December: Pandemic training
   - Late January: Developing coronavirus test kits
   - Daegu containment

2. Test Early, Often and Safely
   - > 300,000
   - Expanded definitions
   - 600 Testing centers
   - 50 Drive-through stations
   - Walk-in centers

3. Contact Tracing, Isolation and Surveillance
   - CCTV, credit card, GPS
   - Mass messaging
   - Surveillance
   - Isolation
   - App monitoring with fines for violation

4. Enlist The Public’s Help
   - Television broadcasts
   - Subway station announcements
   - Smartphone alerts
   - Continuous, transparent public briefings
   - Supplying & wearing of masks
   - Social distancing

$R_0 = \beta \times \tau$

Adapted from New York Times, 10 Apr 2020
South Korea
The Small Things Count

Masks
Barrier
Handwash

Cleaning of public spaces
Fever Check
Will there be Second Wave?

Historical example of Spanish Flu of 1918 – 1919: Three waves!
- SARS-CoV-2 virus less virulent in warm weather. But not completely!
- Now in both Southern & Northern hemispheres
- Highly infectious

2nd Wave Definitely A Risk

Adapted from Uyen Nguyen, Medium 28 Mar 2020
Three Ways to Test for Covid-19

1. **Diagnostic Test: Have the Virus**
   - **RNA**
     - Nucleic Acid RT-PCR – 2-3 hrs Swab Test

2. **Antigen**
   - **Viral RNA**

3. **Sero logical Test: Had the Virus**
   - **Antibody**
     - IgG
     - IgM

**Antibody Test Problems**
- Weak immunity
- Short-lasting immunity
- Different antibodies
- Limited accuracy

**Remember:** Testing requires doing followup
- Contact Tracing
- Quarantine / Isolation
- Treatment
What should individuals do? Of course, follow local governmental recommendations & requirements

- Bear in mind that the great majority of cases are mild or even asymptomatic!

- **Cleaning & Hygiene**
  - Clean hands with soap & water or alcohol sanitizer
  - Cover nose & mouth when coughing or sneezing with tissue or flexed elbow
  - Keep your area and surfaces/things you touch clean

- **Social Distancing**
  - Social distancing (> 2m) as much as possible
  - Avoid close contact with anyone with cold or flu-like symptoms
  - Minimize time in crowds or confined spaces

- **Wear a Mask** when in public spaces

- Ventilate your home and work area when possible

**Most important:** if you have cough, fever and/or difficulty breathing contact your medical authorities according to local requirements
What should organizations do?

Of course, follow local governmental recommendations & requirements

- **Social Distancing**
  - Minimize or eliminate meetings (substitute with telephone or video conferences)
  - If there must be face-to-face meetings, minimize contact and keep distance (> 2m); arrange seating accordingly

- **Managing Contacts**
  - Flexible scheduling; consider different shifts to minimize overlap
  - Smaller teams; don’t rotate individuals among teams in order to be able to track possible infections.

- **Cleaning**
  - For work entrances (both employees and visitors) set up temperature testing at the entrance (and also ask about symptoms).
    - One novel method is to do a smell test (alcohol vinegar)
  - Place alcohol sanitizer in all work areas, especially near entrances, so employees can easily wash their hands (not just in bathrooms)

- **Ventilation**
  - Increase outside ventilation; keep doors open
  - Reduce air conditioning (in hot climates)
  - For enclosed areas, use ventilation with filtration systems; replace filters & upgrade if possible

Most important: encourage anyone with symptoms (employee or customer) to contact the appropriate medical authorities.

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It is very tricky!

- **What do we know about this virus?**
  - Only by destroying it or having the immune system clear it.

- **How can we stop it?**
  - Destroying Type 2 pneumocytes and disrupting ACE2

- **How does it cause disease?**
  - Possible, but won’t be easy

- **What are the prospects for a vaccine?**
  - Likely false positive; possible immune failure
  - Can one be “reinfected?”

- **How does one test for Covid-19?**
  - Three ways: RNA, antigen, antibody, each with pros and cons

- **Do antibody tests work?**
  - Because immunity may not be absolute, likely not 100%

- **Does the virus mutate?**
  - Yes, but must individually isolate in infected cases.

- **Are effective antivirals possible?**
  - There has never been a “curative” antiviral so it like the proverbial “Philosopher’s Stone”
As our case is new, so we must think anew, and act anew.

Abraham Lincoln
Annual Message to Congress, 1 Dec 1862

**My prediction**

- This crisis will inspire **entirely new methods** of diagnosis and treatment.

- In fact, if we don’t *think anew or act anew* we may be **forced to live** with Covid-19 for the indefinite future.
Thank you and please take care!!

Ogan Gurel, MD
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Q&A Part 2

Moderator & Speakers
For more questions, please contact our speakers

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Division  Bangkok Metropolitan Administration

Viktor Fersht  
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