➢ Tuberculosis Research Laboratory

- **M. tuberculosis diagnosis using new methods**
- **Drug discovery**
  - **Q203**

- Inventions
  - Anti-infective compounds
    - Tuberculosis APPN
    - Tuberculosis IPA
- **Assays & Technologies**
  - **QIM assay**
  - **QUM assay**
  - **MDR/XDR assay**
  - **MBC assay**
  - **ATP depletion assay**
  - **Thin Layer Chromatography**
  - **Drug combination assay (Checker board)**
  - **Drug combination assay in ex vivo**
  - **Bacteriolytic assay**
  - **Latent TB in vitro assay**
  - **Membrane MoA evaluation**
- **International Collaborations**
  - **GSK**
- Success Story
  - **First-in-Class Tuberculosis Drug Discovery**
  - **Establishment of Spin-off biotech, Qurient Co. Ltd**

➢ **Vincent Delorme, PhD,Head, Tuberculosis Research Laboratory,** Email: vincent.delorme@ip-korea.org

➢ Respiratory Viruses Research Laboratory

- Develop translational disease intervention strategies for emerging and re-emerging strains
  - Chemical genomics and RNA interference (**RNAi**)
- Investigate the mechanisms of immunity and disease pathogenesis

- Identified promising new viral targets, subjected into **high-throughput screens**, and identified novel small molecules.

- Research on influenza a viruses includes the analysis of virulence and mammalian host adaptation ofH5 and H7 avian influenza viruses.

Assays & Technologies

- **Influenza GFP assay (reporter technology)**
- **Influenza GFP imaging assay (confocal microscopy)**
- **High-throughput micro-neutralization assay**
- **Small interfering (si)RNA screening**
- **Cytopathic effect (CPE) determination assay**
- **Viral entry assay**
- **Protein thermal stability shift assay**
- **Electrophoretic mobility shift assay (EMSA)**
- **Molecular biology and virological laboratory techniques**
- **Reverse Genetics (RG) system**
- **Neuraminidase (NA) inhibition assay**
- **NF-κB (p65) nucleus translocation assay**
- **NF-κB/GFP-Luc reporter assay**
- **Interferon-Stimulated Response Element (ISRE)/GFP-Luc reporter assay**

Ji-Young Min, PhD, **Head, Respiratory Viruses Research Laboratory.** Email: jiyoung.min@ip-korea.org

Leishmania Research Laboratory

- Discovery of novel inhibitors and drug targets focused on two key areas:
  - Discovery of novel lead compounds in collaboration with screening and chemistry platforms in the institute
  - Understanding the fundamental biology of Leishmaniawith a special emphasis on the kinetoplast of Leishmania.

Assays & Technologies

- **Visceral Leishmaniasis(VL) and coetaneous Leishmaniasis (CL) intracellular and extracellular assay**
- **T.cruzi (Chagas) intracellular assay**

- **T. brucei cell-based assay**
- **T. bruceiFarnesyl pyrophosphate synthase (FPPS) assay**
- **Kinetoplast DNA replication assay in replicon system**
- **DNA-binding assay**
- **Topoisomerase I assay (plasmid relaxation assay)**

Joo Hwan No, PhD, **Head, Leishmania Research Laboratory,**Email: joohwan.no@ip-korea.org

➢ Cancer Biology Research Laboratory

- Hepatocellular carcinoma (HCC) prognosis
  - construct a 3D tumor microenvironment in vitro to understand tumor development, progression and chemo-resistance

    (For drug discovery and improvement of personalized cancer therapy)
    - investigated the effect of microenvironment on tumorgenesis by creating a co-culture system
- Assays & Technologies
  - **Hepatocellular carcinoma (HCC) stem cell assay**
  - **3D culture system in HTS/HCS**
  - **Clonogenic survival assay**
  - **Tumor xenograft assay in nude mouse**
  - **Caspase 3 activity assay**
  - ***In vitro* migration assay**
  - **DNA damage assay & micro nuclei assay**
  - **Cell cycle analysis assay**
  - **Cell cycle analysis**
  - **EdU assay**
  - **ROS detection assay**
  - **Autophagy detection**

Haengran Seo, PhD, Head, Cancer Biology Research Laboratory,Email: haengran.seo@ip-korea.org

➢ Computational Biology

- Image Mining
  - creating methods and algorithms that related to image filtering,segmentation, pattern recognition, statistical analysis, and high-performance computing for on TB, HBV, HCV, Influenza, Leishmania and others.
- Chem-informatics and Molecular Modeling
  - To synergize and accelerate the drug discovery process.
    - ligand-based
    - Structure-based
  - Virtual high-throughput screening (HTS) is performed to select possible binding compounds to the known target without the necessity to run HTS.

- Inventions
  - **Method and apparatus for imaging of features on a substrates**

- Assays & Technologies
  - **Image Processing Platform**
    - **Algorithm development for analyzing image data**
    - **Development of the data analysis algorithms**
    - **Development of the customized software modules for biological image and data analysis and data mining**
  - **Cheminformatics& Molecular Modeling**
    - **Cheminformatics& Molecular Modeling**

Yury Tsoy, PhD, Head, Computational Biology,Email: yury.tsoy@ip-korea.org

➢ Sample Management, Automation and Lab Support Operation

- Sample Management & Automation (SMA)
  - Management of the **chemical** and **RNAi** libraries
  - **automation** of the assays on several screening platforms
    - chemical library consists of approximately 180,000 diverse molecules
    - RNAi libraries consist of pooled and single siRNAs options

        - These libraries are: **DharmaconON-TARGETplusSMART**pool siRNA Library which target 18,000 human genes with 4 pool siRNA per genes,
        - Life Technologies Silencer Select, targeting 22,000 human genes with a coverage of about 3 siRNA duplexes per gene
    - Lab Support Operation (LSO)

- Assays & Technologies
    - **Cell-based assay high-throughput screening for chronic/infectious disease using adapted biosafety facility**
    - **HTS chemical screening**
    - **HTS RNAi screening**

Constantin Radu, MS, Head, Sample Management & ... Email: constantin.radu@ip-korea.org

➢ Hepatitis Research Laboratory

- Molecular virology of **hepatitisB** and **C** viruses (**HBV**&**HCV**)
    - infectious HCV cell culture system more than 250,000 compounds were screened:
        - Antiviralshave been identified acting on viral entry and secretion
        - one compound series exclusively inhibits HCV genotype 2
        - Another compound seriesinhibits major HCV genotypes
- Quest to identify and characterize drugs with a novel MoA, for cure **chronichepatitisB**.
    - Screened for pre-genomic RNA encapsidation inhibitors and for immunomodulator restoring innate immunity in chronically **HBV** infected hepatocytes.
- Re-emergence of the **Ebola**: devised strategies to identify immunomodulator, replication and entry inhibitors.

- Inventions
    - **Compounds for treating viral infections (Hepatitis C Virus)**
        - a novel hepatitis C virus (HCV) inhibitor by phenotypically screening of small molecule libraries using infectious visions

- **Assays & Technologies**
  - **HBV epsilon Polymerase assay**
  - **HBV polymerase interferon β reporter assay**
  - **HBV nucleocapsid-captured quantitative real-time RT-PCR assay**
  - **HBVcc infection assay**
  - **HBV replication assay**
  - **HBV drug combination assay**
  - **HCVcc infection assay**

  - **HCV RNA replication assay in replicon system [Code No: IPK0208]**
  - **HCV pseudoparticle entry assay**
  - **HCV protease assay**
  - **HCV helicase assay**
  - **HCV polymerase assay**
  - **HCV spread assay**
  - **HCV entry kinetics assay**
  - **HCV equilibrium density gradient**
  - **HCV drug combination assay**
  - **HCV virucidal assay**

- **International Collaborations**
  - **Sanofi**

- Success Story
  - **Hepatitis C Drug Discovery**
    - targeting E1
    - inhibits the cell-to-cell spread

Marc P. Windisch, PhD,Head, Hepatitis Research Laboratory , Email: marc.windisch@ip-korea.org

➢ Antibacterial Resistance Research Laboratory

- Antibiotic resistance
  - *P. aeruginosa*

        - Currentlytaking a new agenda for tackling another superbug, *Staphylococcus aureus*.
    - Multi-drug resistance (MDR)
    - new antibacterial discovery against superbugs
    - knowledge of bacterial physiology
        - essential to develop culture system that mimics the micro-environment of the infection sites of ***P. aeruginosa***
            - Developing anew artificial-sputum medium (ASM2) containing mucin, and implemented it to a compound screening system for ***P. aeruginosa.***
        - Co-culture assay of ***pneumocyteA549*** and ***P. aeruginosa*** : for *ex vivo* culture condition

    - Assays & Technologies
        - **Pseudomonas aeruginosa assay in optimized Artificial Sputum Media (ASM)**
        - **Co-culture pneumocytes with Pseudomonas aeruginosa**

Soojin Jang, PhD,**Head, Antibacterial Resistance Research Laboratory**, Email: soojin.jang@ip-korea.org

➢ Dengue Research Laboratory

- Studying mechanisms leading to the systemic disease upon dengue virus infection
- developing assays to test and identify compounds targeting NS1 to both clear the virus and abort pathogenesis in parallel
    - In collaboration with Marie Flamand's team in Institute Pasteur Paris Structural Virology Unit

➢ Assays & Technologies

- **Assay Dev & Screening Group and Technology Development Platforms**
- **Anti-HIV cell-based assay(s)**
- **5-HT2C receptor internalization assay**
- **Leptin receptor internalization assay**

- **Tau protein phosphorylation assay**
- **Gamma secretase activity assay**
- **Beta secretase activity assay**
- **Cell-based assay development and optimization for HCS**
- **Cell-based assay development and optimization for PPI**
  - protein-protein interaction (PPI)
- **Cell-based assay high-throughput screening for chronic/infectious disease using adapted biosafety facility**

Kyu-Ho Paul Park, PhD, Head, Dengue Research Laboratory, Email: kyuhopaul.park@ip-korea.org

Discovery Chemistry

- Focused on reducing the time and cost associated with discovery of novel drug candidates
- Discovery of drug candidates for infectious diseases (i.e., tuberculosis, hepatitis B and C, influenza, super-bacteria, neglected disease,)

Assays & Technologies

- **Compound solubility test**
- **Compound synthesis**
  - chemical synthesis of compounds in small to medium scale
  - synthesis of nucleosides, peptides and natural products
  - synthesis of assay development tools and reagents
  - synthesis of cold-labeled (C13, H2, N15) compounds
  - purification of active materials from extracts
  - structure determination
  - Performing structure-activity relationship (SAR) studies

Moon Hwan Kim, PhD, Executive Director, Discovery Chemistry,Email: moonhwan.kim@ip-korea.org

R&D Infrastructure

Biosafety Level 3 Laboratory (BSL-3)

- Designed to handle the risk group 3 pathogens such as HIV, tuberculosis stains, high infectious influenza and rabies

Biosafety Level 1 Laboratory (BSL-1)

- Designed to handle the risk group 1 pathogens such as E-coli, cancer cells and stem cells

- **Chemical Laboratory**
- **Screening Platforms**
  - **Sample Management Solutions**
    - Chemical Screening
    - RNAi Screening
  - **Automation Management Solutions**
    - Assay Optimization Tools
    - BSL-3 Automated Platforms
    - BSL-2 Automated Platforms

- **Biosafety Level 2 Laboratory (BSL-2)**
  - Designed to handles the risk group 2 pathogens such as low infectious influenza, HBV, HCV, leishmania, trypanosome and hospital-acquired bacteria
- **Animal Laboratory**
- **Radio Isotope Laboratory**

Inventions

- **A method of detecting and/or quantifying expression of a target protein candidate in a cell, and a method of identifying a target protein of a small molecule modulator**
- **Genome wide visual identification of human co-factors of HIV-1 infection**
- **Compounds for treatment of inflammatory diseases, cancer, stroke, and Alzheimer's disease**
- **Compounds for treatment of inflammatory disease**

InternationalCollaborations

- **Servier**
- **DNDi**