



Scalable Metagenomic Surveillance in Public Health Laboratories

Project Background

On 09/12/2023, International Responder Systems was one of thirteen recipients awarded a five-year cooperative agreement from the Centers for Disease Control Center for Forecasting and Analytics to implement disease forecasting models nationwide. International Responder Systems is working on a proof-of-concept approach to nationwide implementation by first working with the Pacific Rim Consortium state laboratories and Health Officials. This voluntary initiative seeks to establish a regional proof of concept for modeling and analytics, with the ultimate goal of nationwide scalability for Public Health Laboratories.

Project Overview

This initiative aims to enhance the capabilities of Public Health Laboratories by granting them access to the UCLA SwabSeq Metagenomic Diagnostic Platform for comprehensive pathogen and variant identification. This support will bolster outbreak forecasting analytics, supplemented by the deployment of dashboards, utilization of geospatial data, and implementation of models. Initially, the primary focus will be on metagenomic analysis or agnostic testing for pathogen and variant identification of samples procured by public health laboratories, with particular attention given to evaluating reception and expanding opportunities within the APHL Pacific Rim Consortium. Additionally, potential expansion to local public health labs in California is under consideration. Result dissemination will be facilitated through the SOAR platform.

Over a period of 9 months, the project will unfold, featuring regular evaluations with participants to track progress, adapt strategies as needed, and ensure alignment with identified deliverables and milestones. Insight Net, established in 2023 by the Centers for Disease Control and Prevention's (CDC) Center for Forecasting and Outbreak Analytics (CFA), is dedicated to building modeling and analytic capacity within health departments nationwide. This network prioritizes training, the development of analytical tools, and advancing the analysis and utilization of infectious disease spread data.

Comprising more than 100 academic and private entities, as well as state, tribal, local, and territorial (STLT) health departments, this collaborative partnership is structured into three categories: Innovators, Integrators, and Implementers. These groups collectively develop, test, and implement innovative outbreak analytic solutions for the CDC, health departments, and other key decision-makers nationwide.

The tools and methodologies crafted by Insight Net will play a pivotal role in preempting infectious disease outbreaks, empowering public health leaders to make well-informed decisions and take proactive measures to safeguard their communities during public health emergencies.

<https://www.cdc.gov/forecast-outbreak-analytics/partners/insightnet/index.html>



Project Participants

International Responder Systems, partnering with UCLA, and contracting work from the firms Lumina Labs, and iConnect Consulting, will initially offer the program to the Pacific Rim Consortium of the Association of Public Health Laboratories (APHL) and the local Public Health Laboratories in California (CAPHLD).

Project Plan

30 Days	60 Day	90 Days
<ul style="list-style-type: none"> •Memorandum of Understanding (MOU) reviewed and signed by participant •Process flow developed •Data Use Agreement (DUA) verified •Public Health Laboratories Identified as Participants 	<ul style="list-style-type: none"> •Participating Labs briefed and trained on process •Proof of Concept / Testing begins •DUA confirmed •Model finalized with UCLA Computational Medicine •Evaluation structure set up 	<ul style="list-style-type: none"> •Evaluation begins •Feedback loop monitored •Scaling discussed •Revisions made as needed •Determination of Go vs. No Go •SOAR API completed for data viewing

Communication Platform

International Responder Systems will implement the STLTs Outbreak and Analytics Response (SOAR) platform to enable both nowcasting and forecasting capabilities. This encompassing provision will entail comprehensive capability and capacity details pertinent to Public Health Laboratories (PHLs). SOAR will serve as a repository for reference documents, standards, and communication materials associated with the response and recovery phases of Metagenomic Surveillance efforts.

SwabSeq Metagenomic Diagnostic Platform & Model

The UCLA SwabSeq Metagenomic Diagnostic Platform is a meta-genomics based untargeted next generation sequencing (NGS) diagnostic designed to detect nucleic acids from a pathogen from upper respiratory tract specimens collected from patients who are suspected of infection. Samples undergo nucleic acid extraction followed by NGS library preparation and sequencing. Results of sequencing are then processed by a bioinformatics pipeline which performs quality control, checks for internal controls, and matches reads to a pathogen which is then used to make a diagnostic call. The platform has been



validated using contrived samples to show acceptable limit of detection and retrospective clinical samples to show excellent performance compared to targeted PCR tests.

The SwabSeq Metagenomic Diagnostic Platform has been validated to detect respiratory pathogens commonly included on multi-pathogen PCR platforms including SARS-CoV-2, Human Coronaviruses, Human Metapneumovirus, Parainfluenza Virus 1-4, Rhinovirus/Enterovirus, RSV, Adenovirus, and Influenza A/B (including identification of Influenza variants). In addition, the SwabSeq Metagenomics Diagnostic Platform has successfully identified other pathogens not commonly on multi-pathogen platforms including Influenza C, HSV and Coccidioides.

The SwabSeq Metagenomic Diagnostic Platform is deployed at UCLA using large scale automation and high throughput sequencing which results in a scalable low-cost approach to metagenomics. Multiple sample types are supported including respiratory swabs, saliva as well as other sample types. Samples are transported to UCLA either in test kits provided by UCLA or using existing sample containers. Results are returned electronically to the public health laboratory.

The development of the SwabSeq Metagenomic Diagnostic Platform is supported by the BARDA (Biomedical Advanced Research and Development Authority) DRiVe (Division of Research, Innovation, and Ventures) NGS-Agnostic Program and the CDC Advanced Molecular Detection Program. For further information visit: <https://swabseq.comped.ucla.edu/>

Laboratory Connectivity and Logistics

Since 2016 iConnect Consulting has been providing its cloud based ETOR (Electronic Test Orders and Results) LWP platform to public health laboratories around the country offering submitters an intuitive, real-time interface to order tests, track progress and view results. To date iConnect LWP platform has been installed in 25 distinct state PHLs, processing 7.5 million orders and delivering results to more than 7,800 submitting facilities. iConnect is currently facilitating ETOR exchange for several Pacific Rim Consortium laboratories including CDPH, HI DOH, WA DOH, NV DOH.

In 2023 iConnect Consulting has partnered with International Responder Systems on CDC's Center for Forecasting and Outbreak Analytics Insight Net initiative. As part of this initiative iConnect will integrate with SOAR to provide predictive dashboards, geospatial data utilization and modeling guidance. For further information visit: <https://www.icconnectconsulting.com/>

Project Principles

- Collaborating with APHL and the Pacific Rim Consortium to introduce and champion the project
- Elevating awareness among Health Officers and Epidemiologists regarding the project
- Ensuring consistent participation in communication meetings
- Broadening Memorandum of Understanding (MOU) agreements
- Formulating Data Use Agreements (DUA)
- Overseeing Courier and Shipping logistics
- Emphasizing advanced modeling to enable nationwide scalability for Public Health laboratories