Real-Time Open Data Sharing of Zika Virus Research using LabKey
Who We Are

Laboratory of David H O’Connor
University of Wisconsin Madison
Aids Vaccine Research Lab

Areas of research:

Non-human primate genetics: MHC, KIR, FCGR
HIV / SIV
Host / pathogen interactions in Non-human primates
Novel viruses in Non-human primates

…. lately ZIKA
LabKey Usage prior to Zika

Our lab has been using LabKey server for years prior to Zika

- Electronic laboratory notebook system
- High throughput sequencing data archival
- Purchasing management
- Contract reporting of results
- Freezer / reagent inventory
- Animal records

Prior familiarity with the system helped with getting Zika studies presented in labkey
The laboratory of David O’Connor at the University of Wisconsin-Madison has been involved in Zika virus research during the recent outbreak in the Americas. The laboratory is conducting studies with several goals:

- Establish the natural history of infection
- Create an animal model of disease progression (Rhesus macaques), that can be used to target future vaccine development
- Explore the role of Zika virus infection during pregnancy causing birth defects (E.g. microcephaly)
Multi Disciplinary Team of Scientists

Rapidly assembled a large group of researchers to address the Zika virus outbreak

• Multi-disciplinary team allows for rapid, expert interpretation of data
• Presents challenges aggregating data and interpretations
• Data of numerous types being generated daily
Real-Time Data Sharing

Our lab determined Real-Time data sharing was critical to addressing the public health emergency of the ongoing Zika outbreak

• A diversion from the traditional wait to publish model
• Real-Time release of data important for public health officials to provide guidance to the public
  • Study data released has informed guidance given by the NIH and CDC
• Open sharing of data reduces the number of primates needed for research, prevents duplication of effort
We began by setting up our zika sharing portal on our own labkey server

- LabKey server’s study module provided a centralized place to store and display data being collected in real-time
Real-Time Data Sharing

We then moved our zika study portal to a labkey hosted server

- Benefit from a professionally managed server
- Allow other groups doing zika research to setup their own study portals in the same place
Gotten a little bit of attention...
How We Use LabKey Server

- Data contributors upload raw data to datasets within a Private Master study
- Sub-studies are published that draw from the main pool of data within the Private Master study

- Immunology data
- Viral Load Data
- Animal Blood chemistry, weight, etc.
- Ultrasounds
Advantages of the Study Module

- Study module allows for automatic propagation of data from master study to sub studies based on participant ID
- Study module allows for deidentification of animal IDs
- Data contributors only have to be trained how to upload data to one place, and the data becomes available in real-time
- Centralizing the data means passing spreadsheets through email is a thing of the past

- Complicated studies tracking data over an extended period of time aided by centralization and standardization of data collection

Data types we post to public studies

Viral load time charts

- Viral RNA copies measured in different fluid samples over time

Plasma viral load
Data types we post to public studies

Participant health data
• E.g. animal weight during study, blood chemistry etc.
Data types we post to public studies

Ultrasounds

- Ultrasound images with meta data managed by custom views / queries
Data types we post to public studies

Immunology Data

- T cell counts measured over time relative to date of infection
- Flow cytometry cell staining imagery
Data types we post to public studies

Sequencing Data
• Interpretations of viral sequencing data posted alongside raw data

Assessment of challenge stock variants

The most interesting region of variability involves a sequence at position 1430-1441 (relative to Genbank LC002520) where the major sequences have a 4 amino acid in-frame deletion. Reads that do not have the deletion have two non-synonymous nucleotide changes region.
Data types we post to public studies

Messages Webpart
- Interpretations of data communicated as small stories within the messages webpart. Helps communicate context associated with data.
Preformatted HTML posting in Wikis

Ability to post blocks of preformatted HTML allows for posting of reproducible analysis methods

- Featured: Heat Map generation from peptide array data using python

```python
# make heatmap and save as figure
dataframe_fig = pivoted.iplot(kind='heatmap',
                            layout=layout,
                            colorscale='rdylbu',
                            world_readable=False,
                            asFigure=True)

# set zmin = 0 to not plot negative values
dataframe_fig['data'][0]['zmin'] = 0

# set zmax to 1000 to amplify modest responses
dataframe_fig['data'][0]['zmax'] = 1000

# set filename
filename = 'cufflinks/17912/zikaOpen' + '/' + title + 'zmax1000'
py.iplot(dataframe_fig, filename=filename)
```

Out[63]:

A0A140D2T1 - ZIKV African MR766 isolate, passage details: Vero cells 3x passage

![Heatmap Image](image_url)
Manuscript Writing

Centralizing Data
• Storing raw data and interpretations within the study module provided a central place where a large team was able to retrieve up-to-date information used to quickly draft a manuscript
Welcome

Welcome to the Zika Open-Research Portal, powered by LabKey.

In response to the declaration of the Zika virus as a public health emergency, LabKey has launched the Zika Open-Research Portal to help facilitate collaborative research. This portal provides a platform for investigators to make Zika research data, commentary and results publicly available in real-time.

Projects are freely available to researchers. If you are interested in sharing real-time research through the Zika Open-Research Portal, please contact LabKey to get started.

Investigators

Dave O'Connor
O'Connor Lab, University of Wisconsin–Madison

Project Overview: This project includes raw data, study commentary and results of studies conducted with three Indian rhesus macaques.

View Project >

University of Washington
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Wisconsin National Primate Research Center
UNIVERSITY OF WISCONSIN-MADISON
Celebrating 50 years of life-saving research and humane animal care