

# Member experience on prevention and control for Vector Borne Disease

## Papua New Guinea

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Tokyo, Japan



World Organisation  
for Animal Health  
Founded as OIE

# Vector Borne Disease situations

## 1. Japanese Encephalitis virus

JEV is endemic in PNG, however, there has been no government or provincial animal or vector surveillance program due to other priority diseases in PNG animal and human health. Recently in 2019, There was a project lead by the Australian Centre for International Agricultural Research. To use a One Health approach to establish surveillance strategies for JEV and zoonotic arboviruses in PNG. This involved human and animal health agencies, and Entomology personnel from human and animal health. The pilot surveillance was done in Phase 1, The Project is now in the 2<sup>nd</sup> phase and continues animal surveillance and expanded to undertake pilot human surveillance for JEV and mosquito –borne viral zoonoses. Also exploring the practical application of xenosurveillance for human and animal disease surveillance.

## 2. Lumpy Skin Disease

Exotic in PNG. Risk assessments have been made to determine the risks entering PNG. Contingency plans are being developed. Both Veterinary Field Staff, Veterinary Laboratory staff and Provincial Livestock Officers have undergone workshop trainings with collaborating partners ACDP, DAWE and NAQIA to prepare in the event of a detection and how to carry out diagnostic tests at relevant levels.

## 3. Blue tongue virus

There has been serological evidence in cattle in PNG, however, in the absence of active infections. PNG does not have the sheep population volume in PNG for widespread BTV. This used to be a part of routine joint-border surveillance with Australia and PNG.



Blue Tongue Cattle blood collection \_ Northern Territory Australia staff, Trukai Farm PNG & PNG (Lae) Veterinary Field Services Team



Blue Tongue Cattle vector sample collection\_ Northern Territory Australia staff, Trukai Farm PNG & PNG (Lae) Veterinary Field Services Team

## Historic cases in PNG\_ zoonotic arboviruses

- **JEV**

- Serological evidence of infections of humans and pigs (southern PNG, Western Province, Vanimo), 1989-1998
- Human cases in Western Province (1997-98), Port Moresby (2004, 07-08), suspected outbreak in Milne Bay (1997-98)
- JEV isolated from mosquitoes in Western Province 1997-98

- **MVEV**

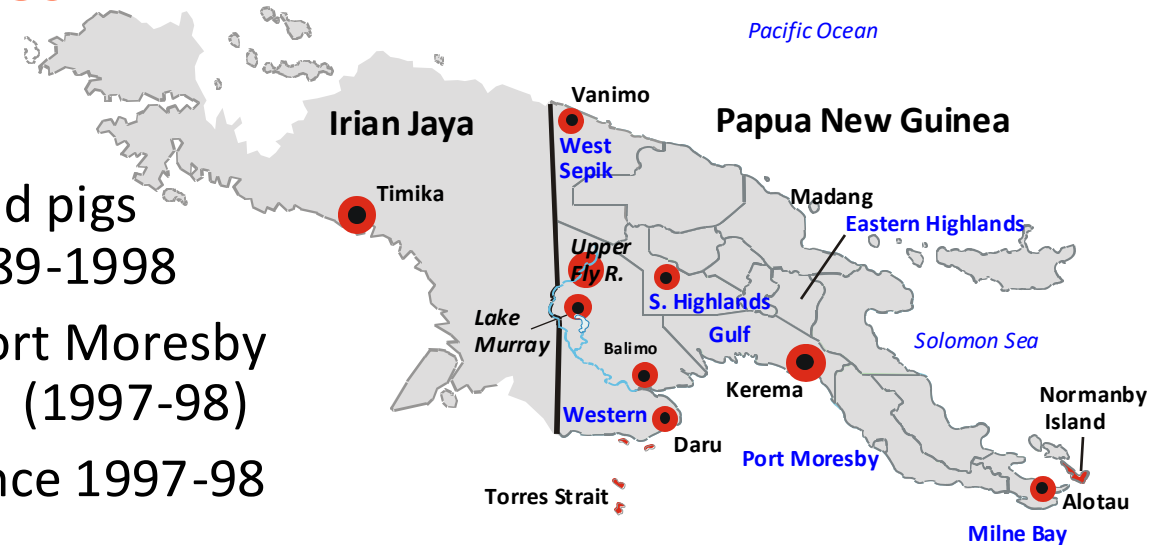
- Only two human cases documented (1956, 1960), serological evidence in lowlands regions
- Isolated from mosquitoes in East Sepik and Western Province

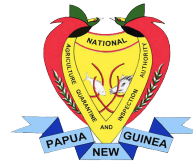
- **KUNV**

- Evidence of year-round transmission from longitudinal serosurvey of children in Sepik district
- No reports of human cases and no mosquito isolates

- **RRV**

- Serological evidence of human infection in several provinces
- Isolated from mosquitoes





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# Detection capacity

| Diagnostic Test                                | Japanese Encephalitis   | Lumpy Skin Disease  | Blue tongue virus  |
|--|---|---|--|
| ELISA  | Available in country<br>(ELISA antibody, <b>In house method</b> ACDP CSIRO for JEV, KUNV & MVE)   | Available in country<br>(ELISA antigen, <b>Commercial kit</b> )   | Not available  |
| RT-PCR   | Available in country  | Available in country  | Not available  |
| Surveillance                                   | Currently establishing pilot surveillance activities at selected sites using sentinel animals and mosquito trapping methods   | No active surveillance done yet. Still in planning. Risk Assessments have been done. Workshops for Vet Field and Vet Lab staff for preparedness done. DAWE Australia, ACDP CSIRO & NAQIA PNG. | Prevalence surveillance  |
| Animal or vector                               | Both  | Animal  | Both   |
| Project/ Collaboration related to surveillance | <ol style="list-style-type: none"> <li>ACDP ACIAR Phase 1 (2019-2021)_Pigs &amp; chickens</li> <li>Phase 2 (2022- ongoing)_Pigs only ACDP Australia, PNG Institute of Medical Research &amp; NAQIA PNG</li> </ol> | NA  | <ol style="list-style-type: none"> <li>BTV Project (2018)_DPI Northern Territory Australia, Trukai Farm PNG &amp; NAQIA</li> <li>Joint Border Surveillance_ PNG(NAQIA) &amp; Australia (DAWE)</li> </ol> |
| Status of project                              | Current   | NA  | Stopped due to the ASF outbreak in PNG 2019.   |

# Japanese encephalitis surveillance



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ACIAR Phase 1 Project (2019-2021)

1. Evaluate current methods to detect zoonotic arboviruses in the field and in the laboratory, and build capacity where gaps are identified
2. Establish pilot surveillance activities at selected sites using one or a combination of sentinel animal (pigs, chickens) and mosquito trapping methods
3. Establish and develop linkages and coordination between human and animal health agencies



# 1. Lab Capacity Building

- Training

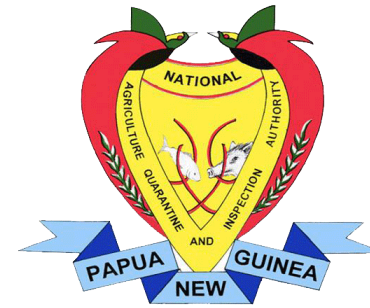
- Focussed on NAQIA National Animal Health and Food Testing Laboratory, Kila Kila
- Lab staff received training in flavivirus serological and molecular testing @ ACDP, Australia
- ACDP provided troubleshooting and technical advice (in country, remotely – email, WhatsApp, online)

- Laboratory assessment (PNG, 2019, 2021)

- **FAO Laboratory Mapping Tool assessment undertaken to review NAQIA laboratory**

- Interlaboratory comparison testing for flavivirus serology

- ELISA testing of panel chicken and pig antiserum of known antibody status (@ NAQIA) – **passed**



L – R: Mr. Di Rubbo (ACDP Serology), Dr. Williams (ACIAR Project Lead and Lead Scientist), Bridgit Fabila-Kavana (NAQIA PNG), Elaine Hevoho (NAQIA PNG) & Dr. Bowden (ACDP Serology)



Ms. Bridgit Kavana performing DNA extraction for PCR Testing, using Human Health Facility PNG Institute of Medical Research and NAQIA, Port Moresby, May 2021.

## 2. Mosquito surveillance

- PNG IMR (Entomology) main partner, with assistance from NAQIA
- Mosquito trapping co-located with animal surveillance sites
- Approx. 30,000 mosquitoes collected from four provinces, 2019-21, used for:
  - *Culex* mosquitoes in 253 pools tested by PCR @ ACDP for JEV and other arboviruses

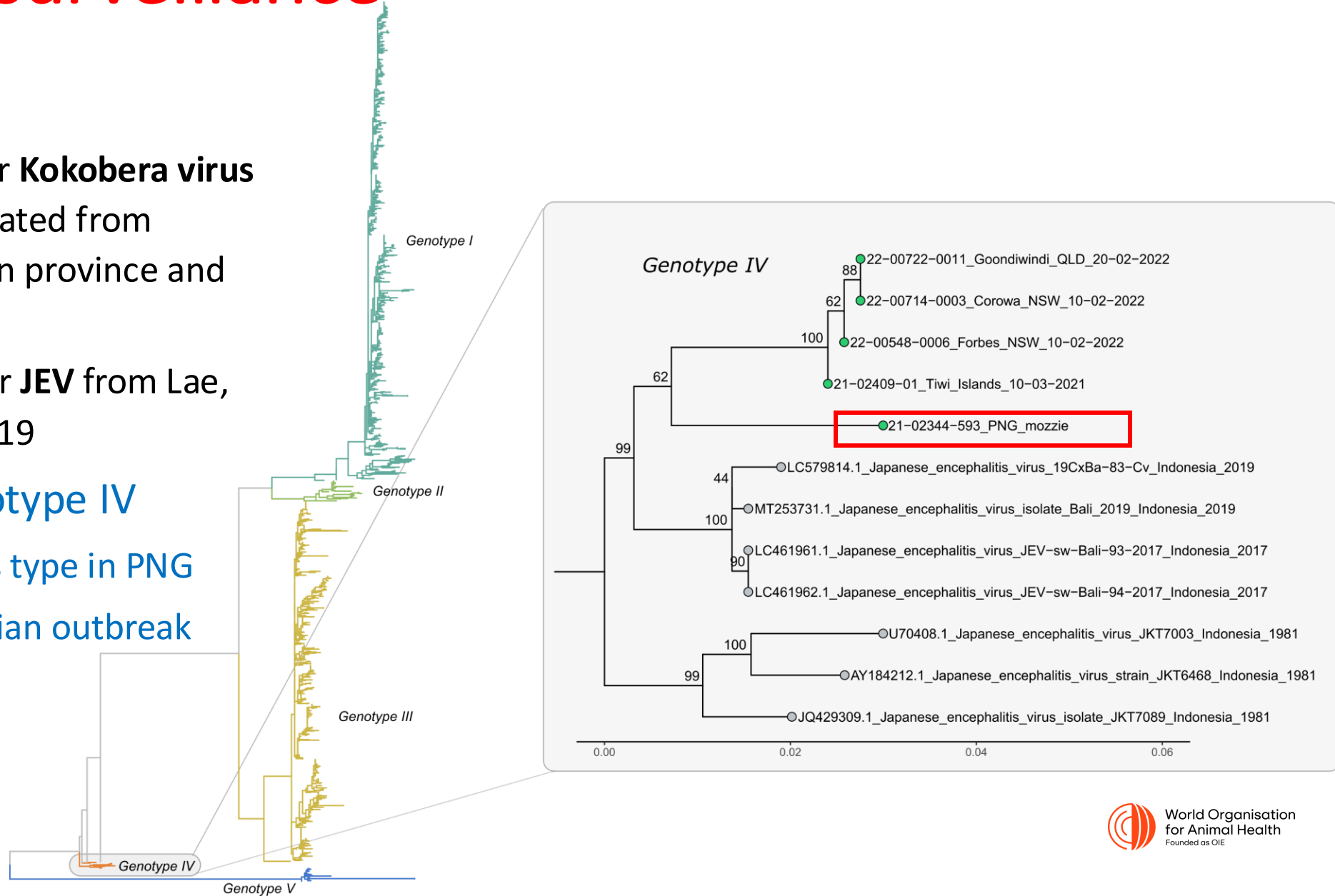


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## 2. Mosquito surveillance

- PCR results:
  - Five pools positive for **Kokobera virus** from mosquitoes isolated from NCD/Central, Western province and Madang
  - Two pools positive for **JEV** from Lae, Morobe province, 2019
- **JEV belongs to genotype IV**
  - First detection of this type in PNG
  - Same type as Australian outbreak strain
  - *Closely-related but different strain*





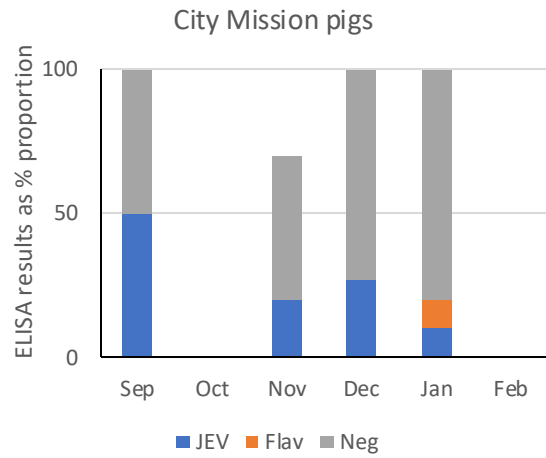
# 3. Animal surveillance

- Pilot surveillance undertaken by NAQIA
- Pigs and chickens, village and farming systems
- Ten sentinel sites in three provinces: National Capital District, Central and Morobe
  - Multiple rounds of sample collections per site
- Serum tested for evidence of seroconversion or seroprevalence for flaviviruses (JEV, MVEV, KUNV)
  - @ ACDP and NAQIA
- Retrospective serological survey of pigs from PNG, various locations, 2016-2018 (@ ACDP)
  - Retrospective samples collected by Australian DAFF and NAQIA for surveillance of pig diseases

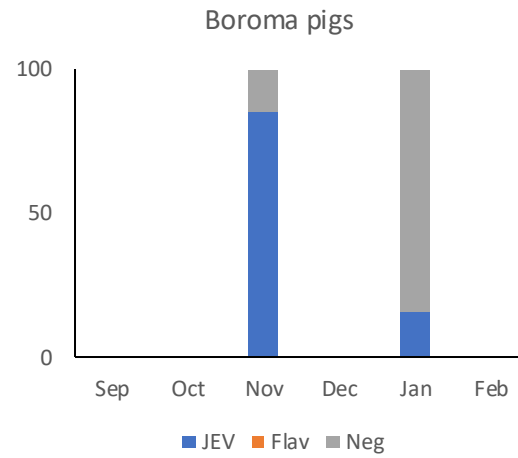


# Animal surveillance: sentinel sites 2019/20

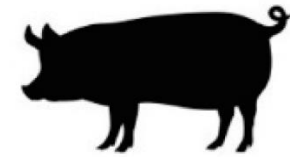
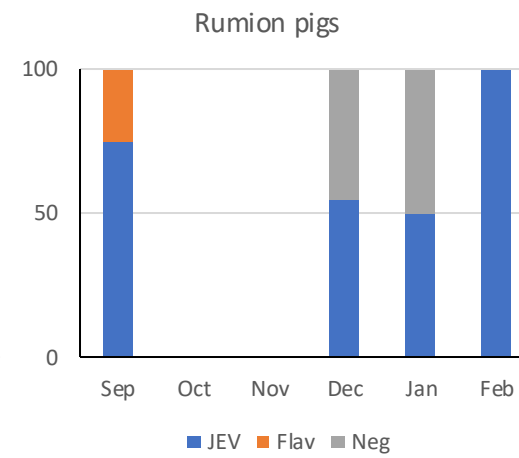
## Central



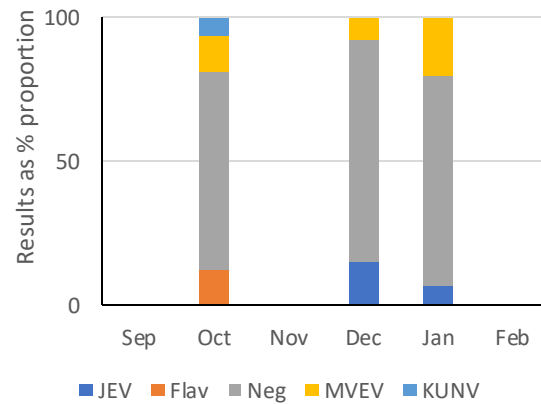
## National Capital



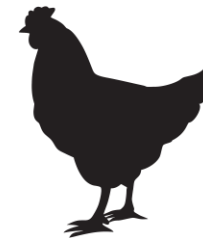
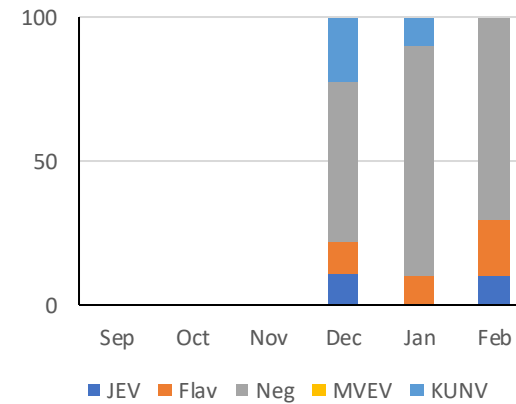
## Morobe



## City Mission chickens



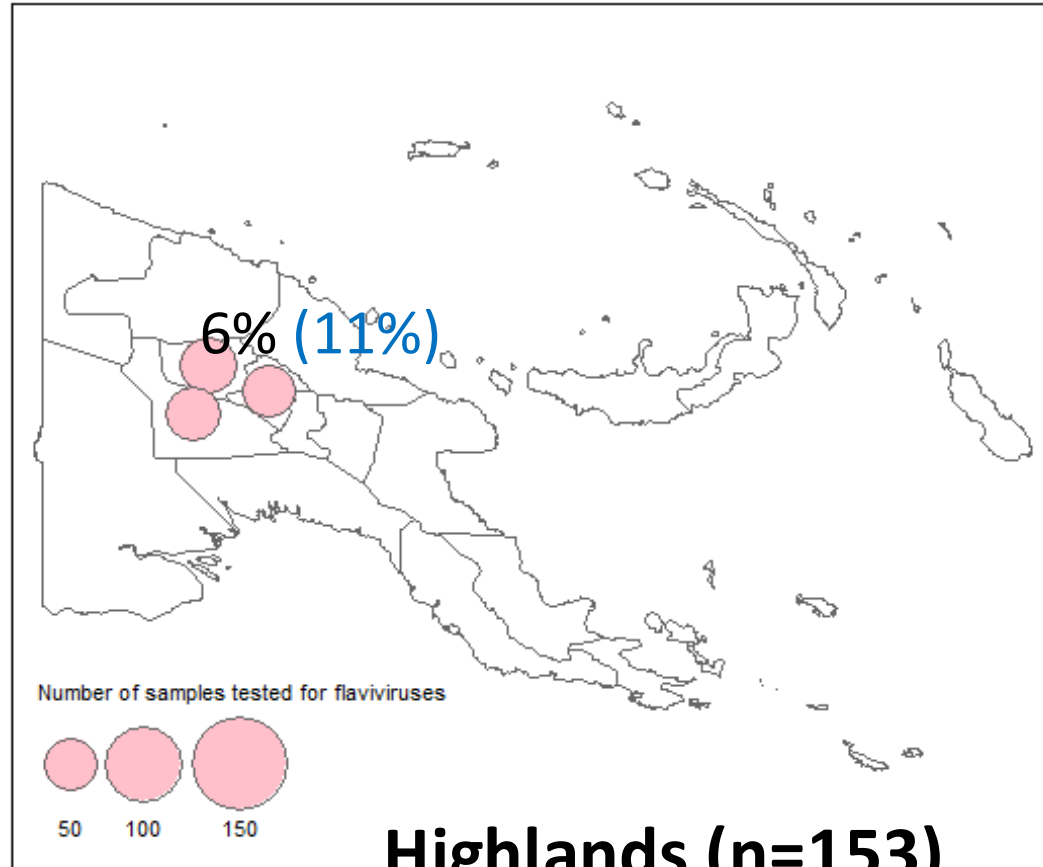
## Ubix chickens



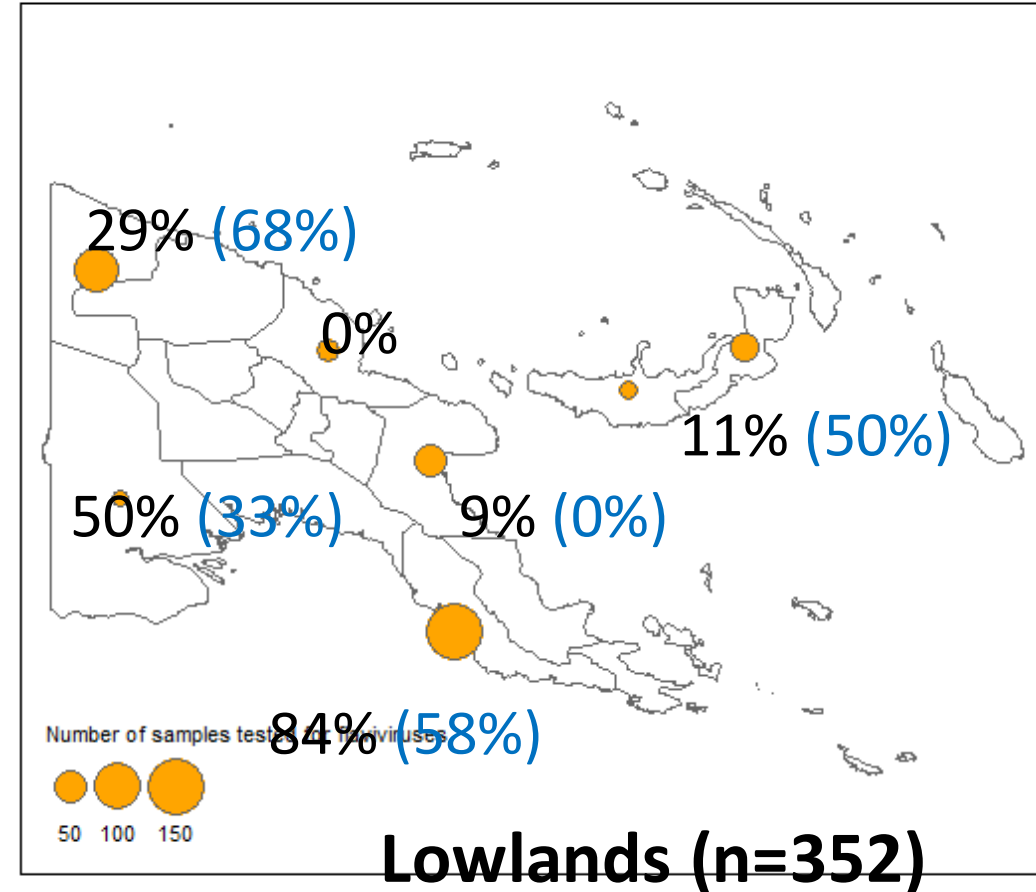
# Animal Surveillance: DAFF/ NAQIA 2016 - 2020

Results: seropositive for **flavivirus** (proportion JEV) → seroprevalence

c. NAQIA ASF surveillance



b. NAQS pigs



Acknowledgement: Peter Durr

# Benefits/ outcomes of ACIAR project Phase 1

- **NAQIA lab capacity building**
  - Flavivirus serology
  - *African swine fever diagnostics, including first PCR testing capacity*
- **Mosquito surveillance demonstrated ongoing JEV activity**
  - First detection in Lae
  - First detection in *Culex gelidus* in PNG
  - First time genotype 4 detected in Australasia (previously G1, G2)
- **Animal serological surveillance provided further evidence of JEV activity in several provinces**

**One health, cross-organisation approach involving different sections of both NAQIA and IMR, strengthened relationship between these organisations**



ACIAR Project Lead, Dr. David Williams and PNG Quarantine Program Manager- VFS with pig farmers on a site visit to one of the local farmers





# Japanese encephalitis surveillance

ACIAR Phase 2 Project (2022-Ongoing)

1. Continue to build capacity for expanded mosquito surveillance to allow direct detection of target viruses in PNG;
2. Continue animal serological surveillance activities implemented in LS/2018/213 and associated DFAT investments to support the above objective (focus on Pigs only)
3. Undertake pilot human surveillance activities for Japanese encephalitis and mosquito-borne viral zoonoses;
4. Explore the practical application of xenosurveillance for human and animal disease surveillance in PNG.



Wearing of PPE before entering Piggery farm for sample collection, as part of Farm Biosecurity



Rope chew in adult pigs to collect Porcine saliva to test for JEV



Blood sample collection for porcine sera for ELISA Antibody testing



PNG\_Serum sample preparation for ELISA Flavivirus Tests\_ Japanese encephalitis, Kunjin Virus & Murray encephalitis virus

# Preparedness Strategies to prevent LSD incursion

## Policy and regulatory provisions

- Animal Movement and Disease Control Act, NAQIA Act
- Biosecurity Policy
- Biosecurity Bill

## Risk assessment

- Conducted Risk Assessment for both FMD and LSD

## Surveillance

- Regular (quarterly) surveillance programs/Sentinel Reporting Systems using EpiCollect5 (web application for data collection)

**Biosecurity measures** – Farm Biosecurity, Behavioural Change Communications

**Border control** – Updated procedures and protocols on imports

**Laboratory preparedness** The National Animal Health and Food Testing Laboratory (NAHFTL) and CSIRO's Australian Center for Disease Preparedness (ACDP) are working together to strength diagnostic capability in PNG through the Terrestrial LabCap Project



*Establishing the Lumpy Skin Disease ELISA Test\_LabCap PNG Project*



*Dr. Annika Suttie, Labcap PNG Project Manager, discussing importance of documentation for Rapid Test Kits with Mr. Andy Yombo, NAQIA Principal Epidemiologist, LSD & FMD Workshop 2023*

# Contingency Planning and Response\_ LSD

- Contingency Plan – ERADICATE PLAN
- ERADATE Plan
- Early Detecting and Reporting – ERADICATE Plan
- Regional Sensitization and Inception workshops
- Incident Command system – ERADICATE Plan – Channel of Command
- Simulation exercise – ERADICATE Plan – Region based workshops
- After action review – ERADICATE Plan – ASF After action review done
- Compensation – ERADICATE Plan – Restitution
- Mobilisation of resources – ERADICATE Plan – Administrative procedures



*PNG CVO demonstrating Post Mortem & sample collection*



*DAWE & ACDP Australia and NAQIA PNG – Joint Workshop*



*Porcine Blood sample collection*

# Challenge and possible solutions

## Challenges

1. Resource limitations for diagnosis, surveillance and response (trained personnel, infrastructure and funding)
2. Lack of knowledge of the epidemiology and burden of these diseases (this impacts surveillance activities- targeted surveillance is difficult with limited knowledge of vectors and geographic distribution)
3. Access to remote locations and locations known for tribal fights

## Solution

1. Using the pilot work that was done using the ACIAR projects where animal health personnel (under Quarantine Animal Health) and Entomologists (under Quarantine Plant Health) were involved.
2. Have more open dialogue and discussions where Animal and Plant Health Quarantine can work together, and roll this out to the Provincial Levels



# Collaboration with other sectors under One Health approach

For Japanese encephalitis, under the ACIAR Project

1. Animal surveillance- NAQIA VFS
2. Mosquito surveillance- Human Health IMR and NAQIA Plant and Animal Health
3. Human surveillance and Burnet Institute

**One health, cross-organisation approach involving different sections of both NAQIA (animal health) and IMR (human health), strengthened relationship between these organisations**

a One Health strategy was adopted, involving human and veterinary/animal health organisations within PNG and Australia. Underlying this approach is closer cooperation between human and animal health sectors, and recognition of the link between human disease, animals and the environment. This approach is acknowledged as being optimal for leveraging capabilities in resource-poor countries and is appropriate for controlling zoonotic diseases that are influenced by human agricultural practices.

Since the ACIAR zoonotic arboviruses project, better linkages between Animal and Human health were developed. Human health sector (PNGIMR) supports the Animal health sector by allowing them to use their PCR facility for not only zoonotic disease JEV but also allows for Priority Animal diseases such African Swine Fever testing, Foot and Mouth Disease and Lumpy Skin Disease. Whilst awaiting NAQIA PCR Lab to be built.

Animal Health sector helps PNGIMR with office space to do Entomology work as well as provide organic sheep blood (from their resident sheep) for human microbiological testing.



L-R: NAQIA (Animal Health) Ms. Bridgit F. Kavana, PNGIMR (Human Health) Ms. Tamara Koleala, CSIRO ACIAR Project Lead ACIAR & Lead Scientist Dr. David Williams, Human Health Ms. Annie Dori



Human Health staff feeding Animal Health Resident sheep, NAQIA May 2021.

# Challenge and possible solutions to strengthen the collaboration

## Challenges

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2. Lack of knowledge of the epidemiology and burden of these diseases (this impacts surveillance activities- targeted surveillance is difficult with limited knowledge of vectors and geographic distribution)
3. Access to remote locations and locations known for tribal fights

## Solution

1. Using the pilot work that was done using the ACIAR projects where there human and animal health personnel and entomologists were involved.
2. Leverage other VBD Human Health projects in-country (e.g. STRIVE, Malaria Trilateral) to continue surveillance in population centers and involve Department of Health VBD units
3. VBD Responses require involvement of public health e.g. risk communications and targeted vector control on farms where mosquitoes breed in waste water (e.g. by promoting and advising on integrated mosquito management approaches)

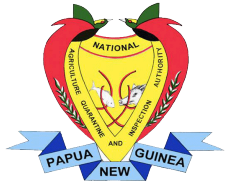


*PNG Molecular Hub Workshop\_ Human Health Laboratory Scientists, Human Health Entomologists and Animal Health Laboratory Scientist with visiting Trainers from Australian Human Health Laboratory*



*PNG Molecular Hub Workshop\_ Laboratory Practical Workshop*

# Acknowledgements



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Dr Caroline Royale

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Mr David Duran  
Dr Anchie Cruz

## **Boroma Piggery Ltd**

Mr Craig Bradfield

## **EBC Farms**

Mr Albert Kish

# Thank you

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## Expectations for the VBDs workshop

- **Please share your expectations for the VBDs workshop**

To share information and also learn from other countries.

Learn first hand from experts and build rapport with these experts

- **What specific information about VBDs you expect to obtain from experts**

To hear of first-hand experience from countries affected by VBDs and how they have overcome this

- **What disease experience you expect to gain from member countries/territories**

Learn how they are dealing with changing dynamics of diseases

One health approaches

Climate change

