

# Development and validation of in-house arbovirus detection capacity for screening of West Nile virus antibodies during a pandemic

Steven T Peper, Whitney A Qualls, Muhammad Farooq, Rui-De Xue

Anastasia Mosquito Control District of St Johns County, St Augustine, Florida, 32092, USA



## Abstract

The Florida Department of Health (FDOH) offers free services to mosquito control districts/programs that includes serological testing of sentinel chickens and arboviral screening of mosquito pools. In light of the COVID-19 pandemic, the FDOH shifted resources devoted towards these services to the state-wide testing of SARS-CoV-2 samples. This prevented many Florida mosquito control districts/programs from obtaining critical information needed to help guide their abatement efforts. In an effort to continue the sentinel chicken services in our county during the pandemic, Anastasia Mosquito Control District (AMCD) established an in-house sentinel chicken and mosquito arbovirus testing program. AMCD started weekly screening of 54 sentinel chickens in June, with screening ongoing. Once the FDOH was able to return to providing these services, AMCD has been able to confirm our sentinel chicken results based on the state lab's testing procedures. To date, all sentinel chicken samples (> 620) tested in-house have been congruent with the state lab results. In-house testing provides results at a much faster rate (same day versus about 3-5 days from the state lab). However, the downside to in-house testing is we are limited to only screening for WNV while the state lab is able to screen for exposure to more arboviruses. \*Data presented in this poster differ slightly from the abstract as additional data was collected post submission\*



## Program Development and Associated Costs

- With the help of Lee County, FL we identified a commercial West Nile virus (WNV) ELISA kit to test our sentinel chicken serum samples
  - ID-Vet (ID Screen® West Nile Competition Multi-species): ~ \$4.5 - 6 per sample depending on quantity purchased
  - Required permit: United States Department of Agriculture – United States Veterinary Biological Product Permit Transit Shipment Only (APHIS FORM 2006 [APR 2001])
  - File a Toxic Substance Control Act (TSCA) Certification and create a customer profile with FedEx for importation purposes
- Required equipment: Purchased a microplate washer (Bio-Rad Model 1575 Immunowash: \$4,750) and microplate reader (Bio-Rad iMark Microplate Absorbance Reader: \$4,750)



## Methods

- 9 sentinel chicken sites were established throughout St. John's County
  - Each site housed 6 female birds (54 total birds in the field plus additional birds housed indoors to replace any potential positive birds from the field)
- All field birds were bled on a weekly basis
  - ~ 3 mL of blood was collected in tiger top serum separator tubes – allowed to clot – spun to separate serum
  - Once the state lab reopened testing, serum aliquots were reserved and sent to the state lab for comparison
- All in-house testing followed the ID-Vet kit protocol

## Introduction

- Mosquito control programs in the state of Florida often use sentinel chickens as part of their arboviral screening efforts since they are not effective amplifying hosts and thus do not play a role in the transmission of arboviral pathogens
- The Florida Department of Health (FDOH) tests chicken serum samples from individual Florida counties free of charge
- In 2020, FDOH delayed offering these services to local mosquito control programs as they turned their efforts to testing SARS-CoV-2 samples
  - This left mosquito control programs throughout the state of Florida without critical information regarding arboviral circulation that is often used to guide their abatement efforts



- In an effort to not lose this critical data, the Anastasia Mosquito Control District of St. John's County, Florida developed an in-house testing program for their sentinel chickens

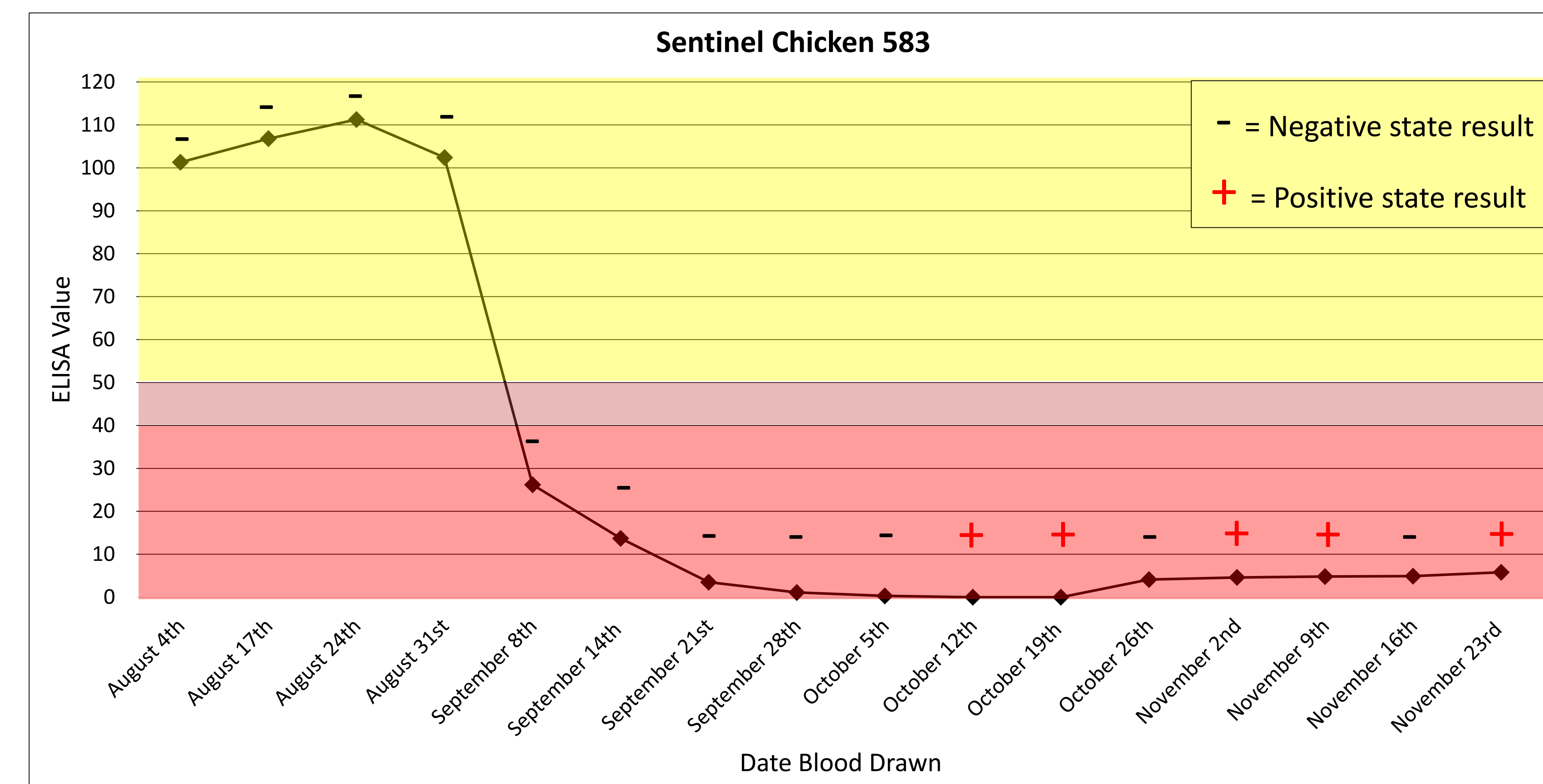
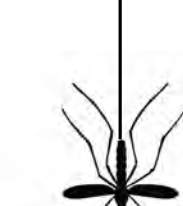


## Results

- 67 chickens were deployed in the field during 2020 (54 original and 13 replacement birds)
  - 1,418 serum samples were tested in total
  - Only 1 bird (Bird 583) tested positive for WNV in-house and was later confirmed by the state lab
- State lab also reported 1 bird positive for SLEV and 3 birds for EEEV

## Discussion

- In-house testing detected our positive WNV bird 6 weeks before the state lab first reported it positive
- In-house testing was more consistent compared to the state lab results
  - Once bird 583 tested positive in-house it remained positive
  - State lab results bounced back and forth between positive and negative
- In-house results were obtained same day while results from the state took 5+ days (sometimes a month + for confirmation)
  - Same day results are very beneficial to rapidly applying results to operational control



## Limitations and Further Program Direction

- One limitation to this in-house testing program is the ability to only screen for WNV antibodies
  - Only chicken/non-species specific commercial ELISA kit we have found is for WNV
  - The state lab is able to screen for multiple pathogen exposures
- Additional limitation is the cost associated with testing in-house – some districts may not be able to afford testing in-house when the state currently provides these services free of charge
- Future direction is to develop in-house ELISAs for SLEV and EEEV

