

Sentinel Surveillance

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OIE Regional Workshop on Vector Borne Diseases

DEPARTMENT OF **PRIMARY INDUSTRY AND RESOURCES**

In the beginning.....

- 1950's Mice, monkeys and man. Arbovirus monitoring in Brazil by Robert Shope and others
- 1969-1978 network of sentinel cattle herds established across Australia and Papua New Guinea by T D St George
- Cattle bled serially from six months to three years of age and monitored for a variety of viruses
- From 1974 concentrated on arboviruses with annual replacement of animals



Beatrice Hill Farm sentinel herd

- Continuous operation since 1969
- 24 BTV seronegative young cattle, individually identified, replaced annually
- EDTA/Lithium heparin blood collected weekly
- Virus isolation through embryonated chicken eggs (ECE) or C6/36 cells
- Serum collected monthly
- Tested for BTV, EHD, PAL and BEF
- BTV isolates sent to AAHL for topotyping/genotyping











BEATRICE HILL FARM
VIROLOGY YARDS



Northern Territory Government

**ARBOVIRUS
MONITORING
BEATRICE HILL
FARM**







Vector monitoring

- Carried out close to sentinel herds
- Insects collected in light traps into alcohol
- Can supplement with live cattle collections
- *Culicoides* identified to species





First isolation of BTV serotypes

- BTV 20 1975
- BTV 1 1979
- BTV21 1979
- BTV 15 1982
- BTV 23 1982
- BTV 9 1985
- BTV 3 1986
- BTV 16 1986
- BTV 7 2007
- BTV 2 2008
- BTV 5 2014
- BTV12 2015

Beatrice Hill Farm BTV and EHDV Serotypes 2010-2018

	BTV1	BTV2	BTV3	BTV5	BTV7	BTV12	BTV16	BTV20	BTV21	EHD2	EHD5	EHD7	EHD8
2010	45	0	1	0	4	0	0	0	0	0	3	0	17
2011	41	4	0	0	0	0	0	21	0	1	2	4	0
2012	102	4	0	0	0	0	0	5	0	3	24	18	0
2013	18	0	0	0	23	0	0	3	0	0	17	3	0
2014	40	0	0	6	0	0	0	20	0	0	17	1	1
2015	1	0	0	72	0	24	0	0	0	0	1	0	0
2016	8	0	0	0	0	0	14	0	2	1	2	16	24
2017	20	17	0	4	0	0	68	0	0	0	12	0	2
2018	1	45	0	1	0	0	66	0	0	0	9	0	1

Beatrice Hill Farm BTV Genotypes 2009-2018

	BTV1		BTV2		BTV5	BTV7		BTV12	BTV16		BTV20	BTV21
	Malaysia A	Australia A	Malaysia A	Java C	Malaysia A	Western related	Java C	Malaysia A	Malaysia A	Australia A	Malaysia A	Australia A
2009	Red											
2010	Red	Red										
2011	Red	Red	Yellow								Grey	
2012	Red			Yellow							Grey	
2013	Red	Red				Green	Green				Grey	
2014	Red	Red									Grey	
2015					Green			Blue				
2016		Red							Purple			Red
2017		Red	Yellow						Purple	Purple		
2018			Yellow						Purple			

Beatrice Hill Farm – Culicoides species 2010-2018

Culicoides actoni	4701	C. narrabeenensis	56
C. austropalpalis	12872	C. ornatus	994
C. (Avaritia) Group 3	1	C. ornatus Group 6	2670
C. brevipalpis	1194	C. oxystoma	2330
C. brevitarsis	31009	C. pallidothorax	157
C. bundyensis	7183	C. pangkorensis	2
C. bunrooensis	5	C. peliliouensis	1
C. calcaratus	35	C. peregrinus	18258
C. clavipalpis	1	C. shermani Group 8	1
C. clavipalpis Group 8	2	C. victoriae Group	12
C. dycei	818	C. victoriae Group 6	10
C. flumineus	1	C. victoriae Group 7	23
C. fulvus	2215	C. wadai	902
C. guttifer	72	C. williwilli Group	3
C. histrio	253	C. zentae	17
C. marksi	33758		



Papua New Guinea sentinel herd

- Commenced 2016
- Commercial herd in the Markham Valley
- 20 young animals, individually identified, replaced annually
- BTV seronegative animals readily available
- Clotted blood collected monthly
- Serum and clots transported to Darwin
- Serum tested by BTV ELISA
- Seroconverted animal clots tested for BTV by PCR
- Positive clots transported to AAHL for BTV isolation
- Sample transport working well















ESCO

PCR waste - NOT OPEN

Form 75
Name: _____
Address: _____
City: _____
State: _____
Zip: _____
Phone: _____
Fax: _____
E-mail: _____
Date: _____

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Papua New Guinea – Culicoides species

C. actoni

C. antennalis Group

C. austropalpalis

C. boophagus

C. boophagus Group

C. brevipalpis

C. brevitarsis

C. clavipalpis Group 19

C. costalis

C. crassus

C. dikhros

C. flavescens

C. fragmentum

C. fulvus

C. guttifer

C. haemophoructus

C. hollandiensis

C. hui

C. imicola Group

C. jacobsoni

C. leei

C. maculiscutellaris

C. marginatus

C. marksii

C. melanesiae Group 2

C. orientalis

C. orientalis Group

C. oxystoma

C. pallidomaculosus

C. palpifer

C. peregrinus

C. pseudostigmaticus

C. recurvus

C. semicerum

C. sumatrae

C. wadai

C. yoshimurai



Timor-Leste sentinel herd

- Commenced 2017
- 10-12 young animals, individually identified, replaced as available
- Small village herds
- Difficult finding BTV seronegative animals
- Clotted blood collected approximately monthly
- Serum tested for BTV in Dili
- Serum and clots transported to Darwin
- Seroconverted animal clots tested for BTV by PCR
- Positive clots transported to AAHL for BTV isolation
- Difficulties with sample transport Dili-Darwin



















Los Palos, Timor-Leste – Culicoides species

C. arakawi	C. palpifer
C. brevipalpis	C. peregrinus
C. brevitarsis	C. pseudopalpalis
C. calculatus	C. recurvus
C. effusus	C. spiculae
C. fulvus	C. sumatrae
C. geminus	C. wadai
C. guttifer	
C. haemophoructus	
C. huffi	
C. hui	
C. notatus	
C. nudipalpis	
C. orientalis	
C. oxystoma	



What have we achieved with sentinel herds and vector monitoring?

- Australia has a robust and sensitive system for detection of new BTV and vector incursions
- The National Arbovirus Monitoring Program monitors spread of BTV serotypes and genotypes and defines free areas essential for trade
- NAMP vector monitoring supports virus monitoring
- qRT-PCR enables rapid identification of BTV isolates and serotypes
- Molecular identification of important vector species has allowed identification of cryptic species
- Serum bank of >100,000 sera for retrospective studies of incursions
- Virus bank of >10,000 viruses including >3,000 BTV isolates from 1981-2018 for study of virus evolution
- Co-operation with near neighbours improves early warning
- Improved laboratory capacity in Timor-Leste

Acknowledgements

- National Arbovirus Monitoring Program – Animal Health Australia, Australian livestock industries, State and Commonwealth governments
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- Veterinarians, livestock biosecurity officers and laboratory staff in Australia, Timor-Leste and Papua New Guinea

Thank you