

Biosecurity and Emerging Threats

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Biosecurity

Biosafety Breaches

2007 - Institute for Animal Health, Pirbright, UK

- Leakage of FMDV was a result of "biosecurity lapses"

2004 - National Institute of Virology, Beijing, China

- SARS outbreak – 9 infected, 1 died

2003 – Plum Island Animal Disease Laboratory, NY

- Containment/security failure – 3 hour power failure

Biosecurity Breaches

Intentional release

- 2001 anthrax attacks, 5 died

International consensus

- WHO Lab Biosafety Manual
- WHO Laboratory Biosecurity Guidelines
- OECD Best Practice Guidelines on Biosecurity for Biological Resource Centres (2007)



National Biosecurity

"the precautions taken to protect against the spread of lethal or harmful organisms and diseases"

"the protection of the economy, human health and the environment from negative impacts associated with pests, diseases and weeds." NSW Government

To prevent the incursion or import of exotic agents into Australia

National Participation - Australia

- 2002 – COAG review of hazardous materials
Regulation, reporting and security relating to storage, sale, handling, transfer and disposal of hazardous materials
- 2006 COAG Report
Recommending a national regulatory scheme for biological agents. Based on risk management approach.
- National Health Security Act 2007
 - Surveillance and response to national and international health emergencies
 - Establishment of a national scheme for the registration and regulation of security-sensitive biological agents (SSBAs)

SSBA Regulatory Scheme



Security Sensitive Biological Agent Standards

Standards for the handling, storage, disposal and transport of security-sensitive biological agents and suspected security-sensitive biological agents

Security Sensitive Biological Agents - SSBA

Tier 1	Tier 2
Abrin	African swine fever
<i>Bacillus anthracis</i>	Capripox virus
Botulinum toxin	Classical swine fever virus
<i>Ebolavirus</i>	<i>Clostridium botulinum</i>
Foot and mouth disease virus	<i>Francisella tularensis</i>
Highly pathogenic Influenza A virus, infecting humans (including Avian Influenza H5N1)	Lumpy skin disease virus
<i>Marburgvirus</i>	Peste des petits ruminants virus
Ricin	<i>Salmonella</i> Typhi
Rinderpest	<i>Vibrio cholerae</i> (O1 and O139)
SARS coronavirus	Yellow fever virus
<i>Variola virus</i>	
<i>Yersinia pestis</i>	

Derived using intelligence information and analysis of impact and feasibility of using the agents in a terrorist act

SSBA Guidelines

- Loss of agents
- Reportable events
- Reporting to law enforcement and national security agencies
- Transportation processes
- Handling samples from a person or animal with an SSBA
- SSBAs in the natural environment

SSBA Standards

Outline requirements for

- Physical security
- Information management
- Personnel security
- Deactivation and disposal of SSBA
- Transport security

SSBA Standards

Physical security

- Perimeter
- Physical access controls
- Storage of SSBAs

Information Management

- Record keeping
- Information security
- Inventory
- Disposal of records

Shipping and Transport

Personnel Security

Ensure that individuals who work in life science laboratories are properly screened, qualified and trained.

- Training and competency
- Recruitment
- Personnel behaviour

Personnel Security

- Behaviour – “the trusted insider”
- Suspicious behaviour
 - Reliability – unexplained periods of absenteeism
 - Working alone or outside regular working hours
 - Dramatic change in appearance
 - Withdrawn, unwilling to socialise
 - Becoming furtive, secretive or excessively anxious or suspicious
 - Interactions with other workers.

Rabies

- 90% cases fatal without post-exposure prophylaxis

CDC

- "As of February 2011, over 100 deaths caused by rabies have been reported in Bali"

DFAT

- Risk of rabies throughout Indonesia – Bali and Nias
- Avoid contact with dogs, cats and monkeys

Sydney Morning Herald

- 5 deaths so far in 2011

Emerging Zoonoses of Concern

- Nipah Virus
- H5N1
- Rabies
- Japanese encephalitis virus
- West Nile Virus
- Dengue
- Chikungunya virus

Chikungunya Virus

- First isolated in 1953 serum febrile patient in Tanzania
 - 1960s to 1990s isolated from many central and southern African countries
- *Togaviridae* family, *Alphavirus* genus (arthritogenic)
- SFV antigenic serocomplex
- Linear +ss RNA genome 11.8kb
- Main vectors *Aedes albopictus* and *Aedes aegypti*
 - in Australia other mosquito species susceptible to virus infection; *Aedes vigilax*, *Aedes procax*

CHIKV Disease

- Incubation 2-12 days, febrile period 3-7 days
- Short viremia

Signs and Symptoms

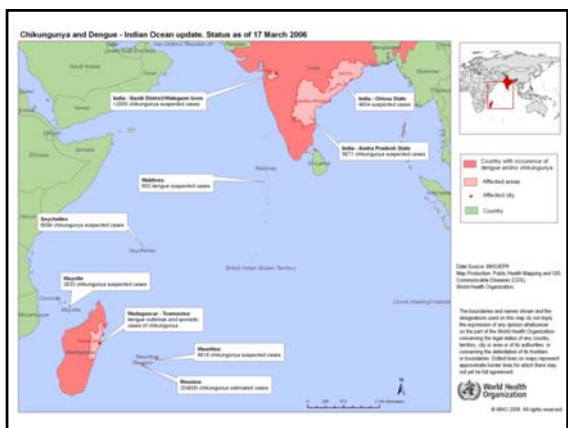
- Acute fever, arthralgia and rash
- Arthralgia - severe joint pain
 - symmetrical and peripheral
 - lasts for weeks to months
 - can persist for years in up to 12% patients

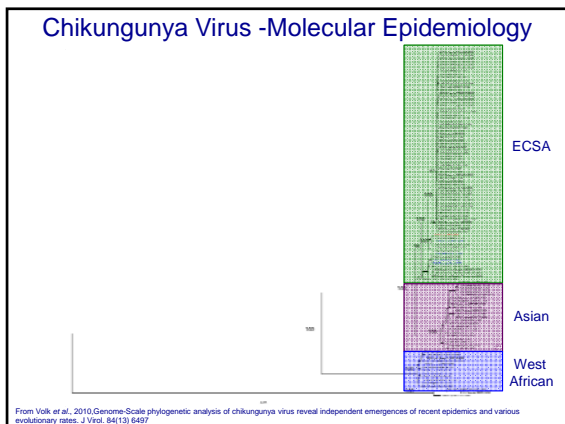
Similar symptoms to RRV

- No effective drugs, supportive therapy

CHIKV Outbreaks

- Outbreaks reported in SE Asia 1960s to 2003
 - India, Malaysia, Indonesia, Cambodia, Vietnam, Myanmar, Pakistan and Thailand
- 2004 Kenya – 2 outbreaks on coast
- 2005 - Spread to Union of Comoros
 - 63% of island population infected
- 2005/2006 Indian Ocean island La Reunion
 - 266,000 cases 248 deaths (approx 34.5% population)
- India 2006/2007
 - 1.4 million cases (attack rate of 45%)
 - Spread to Sri Lanka, Maldives and Malaysia.





CHIKV Outbreaks -Imported

Aedes albopictus present in at least 12 European countries

2005-2009 emerged in Europe

- >1000 imported cases in France travellers returning from La Reunion and other Indian Ocean Islands
- Cases in UK, Belgium, Germany, Czech Republic, Norway, Italy Spain and France, US, Hong Kong, Canada and Taiwan

August 2007 – Ravenna Italy

- Traveller returning from India – by September 254 cases
- Indigenous transmission via *Aedes albopictus*

CHIKV Cases in Australia

Year	Number of Cases
2006	3*
2007	1
2008	12
2009	28
2010	53
2011	11 (to date)

* Commonwealth Games, Melbourne

Prior to 2006

- 1 case diagnosed, Importation from Indonesia in 1989

MJA, 2008, 188(1), p41

- 8 cases of CHIKV in Australia
- Presented at health care facilities in acute phase of infection
- Diagnosis by RT-PCR, 4/8 were IgG and IgM negative

CHIK – New Caledonia

Promed

- Locally acquired case diagnosed on 3/3/2011

Directorate of Health and Social Affairs of New Caledonia

"The risk of a chikungunya epidemic is "extreme""

- 17 cases reported since March 2011 in area around Noumea, vector *Aedes aegypti*

Movement of Emerging Viruses

Disease and in particular animals don't recognise borders

- Sick Travellers
- Scientists
- Movement of Animals
 - AQIS
 - Natural movement
- Movement of Insects

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West Nile Virus in US

Possible origins;

- Bird crossing the Atlantic
 - no trans-atlantic flyways
- Bird being blown to US
- Pigeon (host) hitching a ride on a freighter
- Smuggling birds
- Viremic traveller
- Viremic mosquito
 - international travel, in overhead bins

Northern Australia Quarantine Strategy (NAQS)

Focused on pests and diseases that may enter from northern neighbours

PNG, Timor Leste, Indonesia


Entry via

- Wind currents
- Migratory animals
- Traditional vessel movements and illegal fishing

NAQS Target List

Criteria

- Probability of entry
- Probability of establishment
- Probability of spread after establishment
- Potential significant adverse impact



Invertebrates

<i>Aedes albopictus</i>	vector of human disease
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Animal Pests and Diseases (zoonotic diseases)

Japanese Encephalitis	horses, pigs, humans
Nipah virus	pigs
Highly Pathogenic Avian Influenza	poultry
Rabies	all mammals

Modern transport and mobile populations facilitates the movement of disease

- Air travel has increased by 9% per annum in last 50 years
- Shipping traffic has increased >27% since 1993
- Distance is not a problem anymore for vector dispersal and spread of vector borne diseases

Not only human activity but the natural movement of animals aids in the dispersal of novel diseases to new niches
