The Australian perspective, the Biosecurity Continuum from pre border, to border and post border

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1. One Health
2. Infectious diseases versus food safety
3. The Biosecurity Continuum
4. Conclusions
Biosecurity is the protection of the economy, the environment, social amenity, or human health, from the negative impacts associated with the entry, establishment or spread of animal or plant pests and diseases, or invasive plant and animal species.
A “One Health” framework

- **Animals**
  - (production levels, animal welfare, trade)

- **Environment**
  - (wildlife, ecosystem, tourism)

- **Human**
  - (direct disease, food safety, food security)

- **infectious Disease (food safety)**
The complex of One Health disciplines

**PATHOGEN INFLUENCES**
- Quasispecies variation
- Genetic recombination
- Host/vector adaptation
- Tissue tropism
- Virulence determinants
- Latency/persistence

**HOST INFLUENCES**
- Reservoir host spillover
- Intermediary hosts
- Vector competence
- Susceptible host range
- Pathogenesis
- Immune response

**ANTHROPOGENIC INFLUENCES**
- Globalisation
- Urbanisation
- Land use change
- Behavioral/cultural change
- Regional/global conflict

**GEOPHYSICAL INFLUENCES**
- Climate change
- Climate variability
- Extreme weather events
Assuring the safety and quality of Australian foods within an integrated national biosecurity system

- Characterisation of Food-borne Hazards
  - Capability development in
    - Pathogen genomics
    - Foodborne virology
    - Mycology
    - Chemical & nano hazards

- Through-Chain Risk Analysis
  - Capability development in
    - Risk analysis
  - Through chain food safety
  - Trusted advisor

- Novel Approaches to Risk Management
  - RM Frameworks
  - Validated RM Options
  - Safer Healthier foods
### Infectious Diseases
- Focus on effects of disease on host
- Includes risk prevention as well as response e.g. mainly on farm
- Looks also at treatment in host e.g. vaccination
- Driven by Government and primary product producers e.g. farmers
- Historically major outbreaks have driven change

### Food Safety
- Focus on impacts on humans
- Focus on post farm gate response (but clearly changing)
- Looks at treatment of risk product
- Driven by product processors and retailers
- Large events unusual and more about consumer impact
The “bow tie” approach to risk management

Pathogen
Chemical
Toxin

The Hazard

The likelihood

the consequences

Aerosol spread
Vector borne
Through contact
Through ingestion
Trans-placentally

diseased animals
Production losses
Trade losses
Disease in humans
Environmental damage
When to “act”

GENERALISED INVASION CURVE SHOWING ACTIONS APPROPRIATE TO EACH STAGE

AREA OCCUPIED

TIME

Species absent
Entry of invasive species
Small number of localised populations
Rapid increase in distribution and abundance, many populations
Invasive species widespread and abundant throughout its potential range

ECONOMIC RETURNS (indicative only)

1:100 Prevention
1:25 Eradication
1:5-10 Containment
1:1-5 Asset Based Protection
Emerging risks

- Urbanisation of rural regions
- Encroachment on wildlife habitats
- International movement of people/goods
- Intensification of agriculture
- Global movement of genetic material
- Skill shortages
- Climate change
- Agri-terrorism potential
‘Biosecurity continuum’

• Pre-border
  • Intelligence
  • Risk analysis
  • Address risk offshore

• Border
  • Quarantine inspection
  • Physical entry protection

• Post-border
  • Emergency response (prevention, preparedness, response recovery)
  • Pest and disease surveillance
  • Pest and disease management
Animal Biosecurity Functions

- Federal Government
  - Quarantine
  - Imports and exports
  - Interstate coordination

- States/Territories
  - Incursion (EAD) response
  - Surveillance and disease investigations
  - “Frontline” diagnostics
  - Traceability
  - Endemic diseases management
  - Control and eradication
Pre Border activities

- Identify new or changing threats
- Trade and market access
- Shape and influence policy
- Improve capacity in the Asia-Pacific region
- Regional stability through building trust and strengthen relationships
- Food security
- Proximity
• AQIS manages:-
  - quarantine controls at our borders to minimise the risk of exotic pests and diseases entering the country
  - import and export inspection and certification to help retain Australia's highly favourable animal, plant and human health status and wide access to overseas export markets.

[Box]
- Aircraft
- Ships
- Cargo
- NAQS
Maritime Programs

- Unauthorised Maritime Arrivals
- Marine Pollution
- Compromise to Bio-security
- Illegal Activity in Protected Areas
- Illegal Exploitation of Natural Resources
- Maritime Terrorism
- Piracy, Robbery or Violence at Sea
- Prohibited Imports and Exports
Response Assets

CUSTOMS Bay Class

NAVY Armidale Class

NAVY Leeuwin Class

ACV Ocean Protector

ACV Ashmore Guardian

ACV Triton
NAQS, in support of Government’s broader biosecurity objectives, conducts monitoring and surveillance for exotic plant and animal diseases across the north of Australia, from Cairns to Broome, including Torres Strait.
Why focus on northern Australia?

Exposure to quarantine threats from neighbouring countries

Low human population

Very remote
The role of the Northern Australia Quarantine Strategy

- Manage the quarantine aspects of border movements through Torres Strait
- Identify and evaluate the unique quarantine risks facing northern Australia
- Develop and implement measures for the early detection of targeted pests and diseases
- Strengthen Australia’s quarantine security by contributing to collaborative surveillance and capacity building activities in Papua New Guinea, Indonesia, Timor Leste and other neighbouring countries.
Post – border activities (NAHSS)

Surveillance objectives (NAHSS)

1. Early detection of emerging/exotic diseases or disease agents
2. Demonstration of freedom from diseases/agents
3. Detecting changes in the distribution, prevalence and incidence of disease/agents
4. Detecting changes in factors or events that influence the risk of disease.
Sample and data collection to support disease surveillance

- Using GIS and genetic based tools to better understand host and pathogen population structures
- Using molecular epidemiology to better understand distribution of pathogens
What role does wildlife play in emergency diseases?

The Case of the Feral Pig

1. Quantify endemic disease transmission in feral pigs and cattle
2. Forecast the potential role that feral pigs might play in exotic animal disease (FMD, CSF) incursions
3. Define appropriate surveillance and mitigation strategies
• A One Health approach is essential to managing the risks associated with both food safety and infectious diseases

• There are many similarities but some important differences between the management of food safety versus infectious disease

• Biosecurity (in the Australian concept) looks after both areas

• In terms of risk management, investments in likelihood considerably outweigh consequence management (but the latter cannot be ignored)

• Biosecurity is managed as a continuum from pre-border, to border and post border activities

• From an Australian perspective, focus on re-allocating resources across the continuum
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[logos of various organizations]