Surveillance in a Time of Transition in Farmed Animal Health

A recommendation made by the **National Farmed Animal Health and Welfare Council** on improving Canada's farmed animal health surveillance system.

October 2011

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ADVISORY SUMMARY

Highly significant global changes in new and endemic diseases, public health, zoonotic diseases, globalization in export trade, and climate change are forcing the farmed animal sector into a transition. Through the provision of information vital for decision making, surveillance becomes an essential infrastructure component to support this transition.

Problem Definition:

Despite its essential nature, the present surveillance system contains major weaknesses in organization and decision making, and in information and data-sharing. The problem in the current surveillance system can be defined as:

- a lack of coordinated national leadership,
- lack of a national cooperative surveillance system,
- an inability to detect trends or emerging diseases due to the fragmented and inconsistent state of the existing surveillance system across the country,
- a need for a common understanding of the value of surveillance.

Recommendations

Canada needs, for health, economic, security, and trade reasons, a national farmed animal health surveillance program. The surveillance system needs to engage and address the surveillance needs and values of the relevant industries. As well the essential contribution of surveillance to support health claims, to provide early disease warning, to manage disease risks, and to support public health and food safety, make it vital that current farmed animal surveillance be enhanced.

1. Therefore it is endorsed and recommended by the National Farmed Animal Health and Welfare Council that farmed animal health surveillance be enhanced.

2. Enhancement of the surveillance system will be dependent on collaboration between the farmed animal industry and governments.

Additional recommendations can be grouped under two sub-headings, “leadership and organization” and “technical enhancements”.

<u>Leadership and Organization:</u>

3. It is recommended that leadership be a collaborative model system and be provided through a national corporate structure consisting of:

    - a **Board of Directors** involving all partners to provide national direction to surveillance,
    - a dedicated **Executive Director** to manage implementation of national surveillance,

    - a regional **Node Network** of seven epidemiologists to coordinate the collection and analysis of surveillance data in each region, and the dissemination of surveillance information following analysis.

4. The Council of Chief Veterinary Officers (CCVOs) should be tasked with implementing the organization by

    - negotiating a national agreement of commitment by all major stakeholders,
    - establishing the Board of Directors,
    - engaging the Executive Director,
    - providing an oversight function to the ongoing performance of the Board of Directors.

Technical Enhancements of the Farmed Animal Health Surveillance System

While it is not the intent of these recommendations to specify the technical aspects of a surveillance system, some fundamental characteristics of a desired surveillance system can be recommended:

5. Develop a customized system specific to each industry sector and each province.

6. Negotiate with each industry sector as well as other interested stakeholders as appropriate e.g. public health, wildlife health, and the Canadian Veterinary Medical Association, to decide which diseases should be considered of importance for surveillance.

7. The already existing Canadian Animal Health Surveillance Network (CAHSN), which uses the Canadian Network of Public Health Intelligence (CNPHI), should be employed as the central data processing mechanism.

8. Central data processing should be maintained in the Canadian Science Centre for Human and Animal Health in Winnipeg, because of the existing security in that facility.

9. There should be increased collaboration with public health in the collection of surveillance data for significant zoonotic diseases.

10. Maintain active surveillance for:

    - reportable and foreign diseases
    - export diseases
    - establishment of freedom from specific diseases.

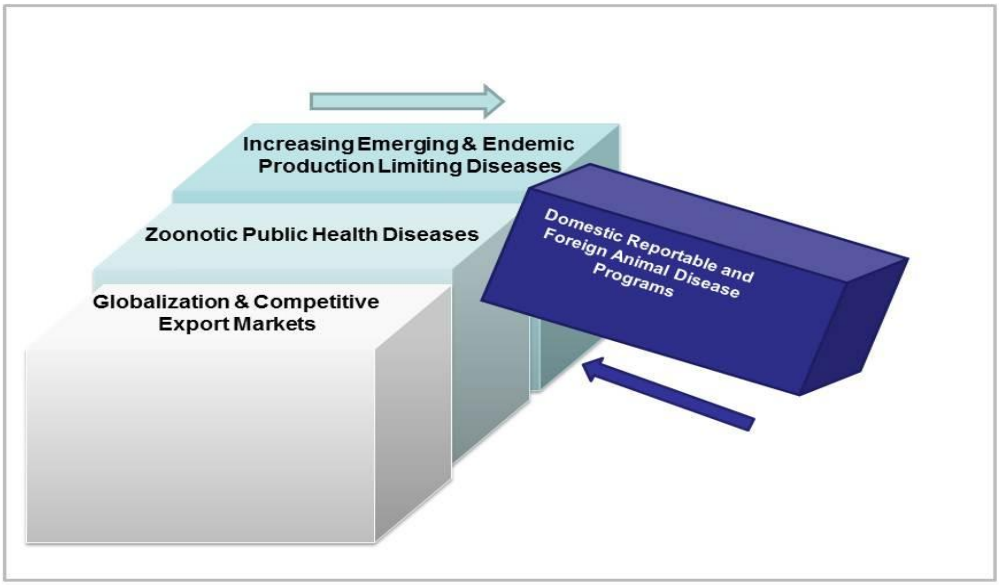
11. Enhance surveillance for production limiting, emerging, and new diseases through novel and innovative approaches to surveillance such as:

    - sentinel herd/sentinel veterinary practice/syndromic surveillance
    - collection and incorporation of abattoir data
    - incorporation of laboratory diagnostic data.

Evaluation of Farmed Animal Health Surveillance

Despite Canada having earned an enviable reputation for its farmed animal health status over the last half century, global changes of high significance in new diseases, zoonotic diseases, globalization in export trade, and climate change are forcing farmed animal health into a transition. This highly respected farmed animal health status has been achieved over this period and up to the present through domestic programs for reportable and foreign animal diseases.

The pressures which are now driving this transition can be exemplified by tectonic plate imagery i.e. large forces that are colliding (courtesy of Dr. Christine Power).



Therefore a competitive tension is building between the demands of domestic programs and the increasing demands of endemic disease, zoonotic disease, and the export trade.

As well, since public health is increasingly involved in the farmed animal sector with such zoonotic diseases as pandemic influenza (H_1N_1), this is driving a linkage between Agriculture and Health at the federal and political level and even globally.

These interconnections clearly involve industry, provincial governments, and the federal government, and require reconciliation. Overall, it is essential that this transition in farmed animal health be managed.

To better position the Canadian farmed animal sector to successfully and profitably respond to these changes, a National Farmed Animal Health and Welfare Strategy was developed to elucidate a future vision and strategic direction. The Strategy was developed in a collaborative fashion involving all major farmed animal stakeholders.

Within the infrastructure components of the Strategy, surveillance was ranked very high as a need of importance. The present farmed animal surveillance system is fragmented and

inconsistent nationally, and is unable to adequately provide the information necessary for the decisions demanded by the changing environment of the farmed animal industry.

Through the provision of information vital for decision making, surveillance becomes an important infrastructure component to support this transition in farmed animal health.

SURVEILLANCE

Surveillance is an infrastructure component which supports agriculture and access to markets. As such, it provides a sense of stability and contributes to the overall management of animal health across multiple species.

Surveillance is the on-going systematic collection, collation, analysis, and interpretation of animal health data, with the dissemination of the resultant information for decision making.

Surveillance should be accepted by industry to provide value to its users at multiple levels (e.g. producers, exporters, veterinarians, provincial and federal governments as well as public health and the environment). Government brings collaboration and infrastructure knowledge, and hence shares the responsibility of contributing to the viability of the farmed animal industry. The relationship between industry and government should be considered as a business partnership, and not as a delivery of client services.

Purpose of Surveillance

The surveillance infrastructure consists of people, process, and technology. It enables and empowers people at all levels to make more effective decisions.

Surveillance protects the health of farm animals and provides information on the health status of the farmed animal population.

It allows early detection of disease and the identification of emerging disease events so that rapid response can be initiated and minimal damage sustained.

Surveillance is the only mechanism to establish verification of freedom from specific diseases for international export market access, and is also necessary to support trade and trade negotiations.

In partnership with public health, surveillance supports the management of zoonotic diseases.

Value of Surveillance to the Farmed Animal Industry

Disease and lack of market access are two of the most significant deterrents to an economically successful farmed animal industry.

Endemic production limiting diseases inflict an on-going economic burden on the farmed animal industry. New, foreign, or emerging diseases result in economic crises for industry if not detected early and mitigated promptly.

Both of these disease circumstances require timely information to avoid these economic hardships. Surveillance is the process of gathering this information in a timely, organized, and scientifically sound manner. A value of surveillance to industry is therefore, through surveillance information, to reduce the economic burden of disease to farmed animal production.

Further, surveillance is the only mechanism for establishing disease status and freedom from disease. This is essential information for permitting and facilitating international trade and market access. Without this information, certain international markets would not be accessible.

In the management and prevention of animal disease, biosecurity is a most important tool. Surveillance information is essential to support and verify the effectiveness of biosecurity.

A cooperative relationship between public health and the farmed animal sector in the collection of surveillance information is critical in the effective management of important zoonotic diseases.

SELECTED CHARACTERISTICS OF A DESIRED FARMED ANIMAL HEALTH SURVEILLANCE SYSTEM:

Although the intent is not to be comprehensive, the following represent characteristics that are considered to be highly desirable for an effective surveillance system:

- continuous collection and monitoring of animal health data
- standardized methods of data collection
- secure and seamless data gathering
- ability to convert data to a standard format
- standardized protocols to validate and analyze data
- confidentiality agreements and partnerships for data and information sharing
- collation of data from existing regional systems to allow identification of national disease trends
- a centralized governance structure
- qualified staff
- rapid detection and reporting of disease
- timely communication of information
- information collection on five categories of farmed animal disease namely:
    - foreign and reportable
    - production limiting
    - trade limiting
    - new or emerging
    - significant zoonotic
- individual farmed animal species networks

PROBLEM DEFINITION

Using the Fore-CAN Animal Health Assessment Tool, an assessment of the present surveillance system was accomplished by a Technical Working Group (see Appendix 1).

Animal health and economic health were considered to be the main drivers for farmed animal surveillance with a high implication for public health, and a high degree of uncertainty associated with ecosystem health.

Within the presently applied surveillance system, a number of the components of a successful surveillance system already exist as strengths (e.g. qualified and experienced individuals, advanced technology, access to a central data processing process, active relationship with the public health data processing system, syndromic surveillance in some provinces, and strong surveillance for reportable diseases). Unfortunately, these strengths are not organized and coordinated nationally and there is no national leadership.

Within the risk management system, the present state of farmed animal surveillance revealed high vulnerability in the areas of anticipation, prevention, preparation, and response.

There were major weaknesses identified in the key capabilities of organization and decision-making, and in information and data-sharing. In addition, there were selected weaknesses in science and technology, expertise and personnel, and in policy, law, and regulation.

The weaknesses identified in order of priority, are:

- leadership and governance
- information and data management
- training and experience in surveillance
- coordination and focus in science and technology
- resource support.

In addition to the weaknesses and vulnerabilities identified in the assessment, there are other factors which also contribute to the defectiveness of the surveillance system.

- Because of a deficiency of information on the status of non-program diseases the economic impact of emerging and production limiting diseases is not recognized.

- There is a problem with information sharing.

- There is a need for a national framework which would incorporate local, regional, and national disease status information.

- Commercial interests must be incorporated into farmed animal surveillance by integrating the commercial mind set with the government mind set.

- There is insufficient information for effective decision making, but there must be a purpose for any information collected. Even the limited information that is currently available is not being effectively used.

In summary, the problem for farmed animal surveillance can be defined as:

- a lack of coordinated national leadership
- lack of a national cooperative surveillance system
- an inability to detect trends or emerging diseases because of the fragmented and inconsistent state of the existing surveillance systems across the country
- a need for a common understanding of the value of surveillance to the farmed animal industry.

Some Practical Examples

To illustrate the complexity and deficiencies of current surveillance in farmed animal health, and the potential value of surveillance to the farmed animal industry and to all Canadians, a few practical examples are offered.

Bovine tuberculosis (a long standing problem):

Bovine tuberculosis is a specified reportable disease under the Health of Animals Act and Regulations. Through an extensive national domestic program involving surveillance and eradication, bovine tuberculosis has been virtually eliminated from Canada.

There remains, however, a reservoir of the disease in the wildlife of Riding Mountain National Park. It is extremely difficult to eradicate the disease from this wildlife population. Periodically, the disease is transmitted outside the Park to neighbouring cattle herds of local producers. This affects the tuberculosis-free status of these herds, and negatively influences trade and marketing.

As well, bovine tuberculosis is a zoonotic disease, being able to be transmitted from animals to humans.

Key Surveillance Considerations:

Surveillance information is essential to detect the disease, to prevent transmission, and to decide on an effective disease management course of action. In this instance the surveillance challenge is complicated by the need to understand the prevalence of the disease not only in ranched cattle, but also in the wild population.

Although the incursion of the disease is extremely detrimental to local producers, the effective elimination of the disease is broadly beneficial to the cattle industry and to Canadians in general.

To establish the most appropriate surveillance to support the most effective disease management approach requires the collaboration, involvement and agreement (because of varying interests and mandates) of all involved parties, including:

- the managers of wildlife in the National Park,
- local cattle producers,
- local hunters and those providing outfitting services
- First Nations groups
- provincial and national environmental agencies and NGOs
- national producer associations,

- federal, regional, and local public health officials,
- federal and provincial animal disease managers,
- designers of the most appropriate surveillance program.

The complexity is revealed in that any effort to actively manage the disease, must consider the economic influence on local producers and those involved in hunting and tourism, the maintenance and sustainability of the wildlife population in the Park, the influence on the economic viability of the national cattle industry, potential human health involvement, and what surveillance information can most productively support a solution to the problem.

Pandemic Influenza H1N1 (an acute crisis):

All Influenza A viruses persist continuously in wild bird populations. Influenza A viruses continually reassort their genetic material and their disease producing potential, by passing between species, including humans. A common pathway is for these viruses to pass from birds to swine, potentially picking up new characteristics, and then pass on to humans inducing respiratory or systemic disease. Although influenza viruses commonly transmit human to human, the bird/mammal/human pathway presents another opportunity to produce new human disease.

In 2009, a new strain of influenza virus (H1N1) caused significant human disease in Mexico, which subsequently spread to other countries. The genetic makeup of the causative strain of influenza contained swine influenza genetic material, but the virus was not causing significant disease in swine.

This was a human influenza virus, but because it contained some swine influenza genetic material (commonly seen in viral genetic reassortment), it became known as a swine influenza virus in the popular press. The true picture was that the virus was not spreading from swine to humans, rather the transmission was from humans to swine.

The disease was identified in a swine herd in Alberta and resulted in a number of negative economic consequences – particularly for the affected producer. This was further complicated by the decision of countries to restrict Canada's export of pork that caused severely and unjustifiably damaged trade in swine and swine products.

Key Surveillance Considerations:

Disease can only be managed effectively by having full information. Surveillance is essential to provide this information. However, in this instance, only Alberta had identified swine influenza as a reportable disease. The disease was not reportable federally or in other provinces other than Alberta and Quebec.

The potential for the introduction of swine influenza into the Canadian herd has been understood for some time. However, the Canadian system for swine influenzas is still uncoordinated. Its "surprise" introduction into Canada would suggest a lack of sufficient foresighting within the Canadian system.

As it is a zoonotic disease, the lack of surveillance coordination between the human and animal health spheres is noteworthy.

Notwithstanding the negative trade consequences, withholding information for short term trade reasons, will profoundly hamper the overall effective management of animal and human disease and, over the longer-term, serve to damage trade.

Johne's Disease (a chronic non-reportable disease):

Johne's disease is not a federally or provincially reportable disease. It is a well established, chronic, production limiting disease of the cattle industry. The recent establishment of the Canadian Johne's Disease Initiative and complementary Johne's control programs across the country are intended to assist producers in minimizing the prevalence of the disease within their herds. However, as yet it is premature to evaluate the effectiveness of these programs.

It is well known that the disease has caused a significant economic burden to the cattle industry – though the specific costs at the farm level, especially for beef cattle, have not been established.

Key Surveillance Considerations:

Being a significant production limiting disease, but not a nationally or provincially reportable disease, the approach, responsibilities and direction have only recently taken on a more coordinated approach.

Producer acceptance of the need to adjust production practices for Johne's disease is only now gradually improving. However, the issue is further complicated by the absence of a rapid and reliable diagnostic test for Johne's disease, which makes a disease eradication program more difficult to develop.

Surveillance is essential to provide the information to support effective identification and management of the disease.

Avian Influenza (global and national on-going threat):

Since the main reservoir for influenza A viruses is in wild birds, this represents a global challenge which has been and will be on-going. Influenza disease in domestic poultry is associated with two main types of avian influenza viruses.

Because of this wild bird reservoir, this remains a constant threat to domestic poultry production. As an example Canada has experienced and dealt with several significant and costly outbreaks of influenza disease in domestic poultry.

Key Surveillance Considerations:

Based on the experience gained through managing these disease outbreaks, a surveillance system for avian influenza, the Canadian Notifiable Avian Influenza Surveillance System (CanNAISS), was established between the poultry industries and the government. This surveillance system also monitors for avian influenza H5N1 which has been circulating globally for several years.

This strain of avian influenza A has globally resulted in millions of domestic poultry either dying or being culled, and a significant number of human deaths. Recently this virus strain has also shown genetic modification. The Canadian surveillance supports early detection, rapid response, and minimal spread of disease and economic loss.

This surveillance program has proven to be highly effective and is much valued by both industry and government.

The surveillance information generated in this program has provided considerable value to the poultry industries and can be regarded as a model of a highly successful surveillance initiative.

RECOMMENDATION

The recommendation is divided into two distinct areas of involvement

- leadership and organization
- technical enhancement of the farmed animal health surveillance system

Leadership and Organization

It is recommended that leadership be a collaborative model system and be provided via a national corporate structure consisting of

- a Board of Directors
- an Executive Director
- a regional Node Network of epidemiologists

Such a structure does not currently exist, and hence this recommendation would transform the present disjointed surveillance activities into a new collaborative organization that would lead and coordinate surveillance nationally.

National direction would be provided by a **Board of Directors** composed of members from all involved partners. The role would be to direct the collaborative collection and distribution of appropriate farmed animal surveillance information.

Functions of the Board would include:

- serving as a collective enterprise to encourage and enable,
- providing a vision and strategic direction,
- identifying national gaps in surveillance information,
- establishing priorities,
- setting national data standards based on technical advice,
- addressing funding or seeking opportunities for shared funding,
- monitoring the sustainability of surveillance programs,
- ensuring the production and availability of surveillance information derived from analyzed data,
- ensuring appropriate and effective communication,
- serving as the national face and voice of the farmed animal health surveillance system.

The surveillance needs of industry would be the driver at the national level.
A dedicated **Executive Director** would manage the national farmed animal surveillance program and implement the directions of the Board.

Functions of the Executive Director would include:

- managing the central data consolidation, ensuring required security and privacy of the data,
- maintaining communication with all regional nodes,
- ensuring timely distribution of information to all users,
- identifying gaps in national surveillance,

- maintaining usage of up to date technology,
- managing the allocated resource base and providing resource information to the Board,
- maintaining central communication with public health.

The multiple different levels (provincial, regional, local, and national) that farmed animal health surveillance requires to be effective, have to be recognized. To achieve this, it is recommended that a "Node Network" be established across the country with a node in each province or region (i.e. British Columbia and Yukon, Alberta and North West Territories, Saskatchewan, Manitoba, Ontario, Quebec and Nunavut, and Atlantic Region). There should be an epidemiologist as an enabler in each node (seven).

Functions of the **Node Epidemiologist** would include:

- collection of surveillance data within the reach of the node,
- analysis of the data to produce information,
- active communication throughout the area,
- active communication with other nodes and with the national Executive Director,
- ensuring the flow of information to all levels including locally (veterinary practices, farmed animal producers),
- ensuring a response is predetermined before data is collected,
- achieving agreement for the collection of data,
- since industry and the provinces own the data, deciding what information could be shared with other nodes and nationally.

To initiate the establishment of this organization, the Council of Chief Veterinary Officers (CCVOs) should be tasked with

- negotiating a national agreement of commitment by all national stakeholders,
- establishing the Board of Directors,
- engaging the Executive Director,
- providing an oversight function to the ongoing performance of the Board of Directors.

Technical Enhancements of the Farmed Animal Surveillance System

While it is not the intent of this document to design the technical aspects of the surveillance, recommendation for some characteristics, determined to be important for a desired surveillance system, are offered.

These recommendations include:

- Based on the unanimous response in a survey of industry, provincial, and federal governments, it is recommended that enhancement to the existing farmed animal surveillance system be pursued.

- It is also recommended that any enhancement to the surveillance system will be dependent on collaboration between the farmed animal industry and governments.

- In Canada, with the geographic breadth and the range of the farmed animal industry needs, it is recommended that a customized system would be developed, providing specific programs for each province and each industry sector based on a national framework (a suggested list of industry sectors is shown in Appendix 2).

- For each industry sector, specific diseases, considered of importance for surveillance, should be identified and ranked by priority through negotiation with the relevant industry sector and other interested stakeholders as appropriate e.g. public health, wildlife health, and the Canadian Veterinary Medical Association (sample lists of diseases for each industry sector are provided in Appendix 3).

- It is recommended that the CAHSN system, which is already developed using the Canadian Network of Public Health Intelligence (CNPHI) system, be employed as the central data processing mechanism. CAHSN would also support the Canadian Animal Health Laboratory Network by providing a mechanism for harmonizing diagnostic tests and protocols.

- It is recommended that central data processing be maintained in the Canadian Science Centre for Human and Animal Health in Winnipeg because of the multiple levels of security already established in that facility.

- It is recommended that increased collaboration with public health, at both the provincial and national levels, be pursued in the collection of surveillance data for significant zoonotic diseases.

- It is therefore recommended that, not only should active surveillance for reportable diseases, export diseases, and the establishment of freedom from specific diseases be maintained, but in addition, enhancement of surveillance for production limiting, emerging, or new diseases should be established through novel and innovative approaches such as:

    - sentinel herd/sentinel veterinary practice/syndromic surveillance
    - collection and incorporation of abattoir data
    - incorporation of laboratory diagnostic data

OPTIONS

For Leadership and Organization:

1. Government Committee System

- primarily driven by regulatory needs
- involving a federal/provincial/territorial committee
- industry is involved in a consultation fashion

PROS

- limited requirement for additional resources

CONS:

- no emphasis on endemic or production limiting diseases
- no early warning capability
- no enhancement of current capability

2. Existing System

PROS

- no change required
- limited requirement for additional resources

CONS

- fragmented and inconsistent availability of data
- not adequately addressing current demands
- does not produce sufficient information for effective decision making
- does not provide an early warning capability
- deficient understanding of the value of surveillance by industry leading to unrealized opportunities.

3. Industry Business Model System

- there would be no government involvement
- to obtain information, government would subsequently negotiate with industry
- industry would only release the information that would be to its benefit

CONS

- would significantly delay and complicate international trade negotiations
- would make it difficult for government negotiators to certify freedom from diseases
- would constitute a significant cost to industry to establish and manage the surveillance system
- would make the development of a central national surveillance system difficult
- would place emphasis on production limiting and economic diseases
- would make cooperation with public health on zoonotic diseases more difficult.

4. Collaborative Model System which is the recommended model

- involves industry, provincial/territorial governments, and the federal government in a partnership relationship,
- would work on the basis of consensus with each partner having veto power

PROS

- provides a greater opportunity to detect emerging diseases and trends, and to provide response action
- represents a blend of public and private interests
- provides a greater opportunity to consider and incorporate public health and ecosystem health interests

CONS

- represents a significant requirement for resources.

APPENDIX 1 – FORE-CAN ANIMAL HEALTH ASSESSMENT OF SURVEILLANCE

Fore-CAN Animal Health Assessment Tool:
This assessment tool evolved from the Foresight for Canadian Animal Health (Fore-CAN) project which focused on capability development for the Animal Health Emergency Management System.

This Tool assessed current surveillance capability on three levels:

- Level 1 – Health Dimension Involvement
- Level 2 – Vulnerability in the Risk Management System
- Level 3 – Weakness in Key Capabilities

The following charts summarize the findings for the current farmed animal surveillance system.

Fore-CAN Animal Health Assessment of Surveillance

1. Level 1 – Health Dimension Involvement

High **Medium** **Low**

	Driver	Implicated	Uncertainty
Animal Health			
Public Health			
Economic Health			
Ecosystem Health			

2. Level 2 – Vulnerability in the Risk Management System

Anticipate			
Prevent			
Prepare			
Respond			
Recover and Renew			

3. Level 3 – Weakness in Key Capabilities[1]

Organization and Decision Making

Vulnerable **Neutral** **Strength**

Leadership			
Accountability and Responsibility			
Inclusivity			
Collaboration and Coordination			
Transparency			

Science and Technology

Informed			
Accessible			
Multi-disciplinary			
Coordinated			
Focused			

[1] Notes to follow

Expertise and Personnel

Availability			
Qualified			
Trained and Experienced			
Interoperable			
Supported			

Policy, Law, and Regulations

Internationally Accepted			
National Best Practices			
Outcome-based Equivalency			
Consultative			
Responsive			

Information and Data-Sharing

Defined			
Targeted			
Consistent & Compatible			
Modern			
Information Available			

[1]Notes on the Assessment of Surveillance:

Organization and Decision Making

This capability in reality represents the governance of national surveillance. As a result of identified weaknesses, a national corporate structure is suggested.

Science and Technology

Collaboration amongst involved agencies can work, but such collaboration depends on specifically identified individuals who are given sufficient time to do so. To date this has not been successful.

At present, there is a need to align the data capture needs around emergency management, but when this is considered from a surveillance perspective, there is no national vision for a national surveillance system. As well, there may be a need for resources to engage programmers.

It is expected that export markets and processes will drive surveillance. Another driver could be the veterinarians' need to serve their clients. The veterinarians have yet to be convinced of the value of this surveillance which is to reduce the burden of disease by providing surveillance data and information to the producer via the veterinarian. Another driver could be food safety, enteric pathogens and the need to consider temporal/partial relationships.

Expertise and Personnel

There is a present requirement to engage data technicians and programmers for surveillance to be fully effective.

It is suggested that a "Node System" be developed in which provincial epidemiologists would serve as the node representative.

Data would be automatically captured and locked down in the Canadian Animal Health Surveillance Network (CAHSN).

The Node Epidemiologist would examine the data and would decide if additional analysis is required. The province would own the data and would decide if it could be shared with other provinces or nationally.

Information and Data Sharing

CAHSN should be the central data infrastructure and should operate under the central governance structure.

Surveillance is a national asset

To be fully functional, the peripheral components of national surveillance have to be developed to full competence as well.

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APPENDIX 2 – FARMED ANIMAL INDUSTRY SECTORS

1. Alpaca and Llama
2. Beef cattle
3. Bees
4. Bison
5. Cervids
6. Dairy cattle
7. Equine
8. Goats
9. Livestock genetics
10. Mink
11. Pharmaceuticals and biologics
12. Poultry
13. Rabbits
14. Sheep
15. Swine

APPENDIX 3 – CATTLE (BEEF & DAIRY)

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Actinomycosis				✓			
Aino virus infection		✓				✓	
Akabane disease		✓				✓	✓
Anaplasmosis	✓	✓				✓	✓
Anthrax	✓	✓			✓	✓	✓
Babesiosis	✓		✓			✓	✓
Besnoitosis				✓		✓	✓
Blackleg				✓			
Bluetongue	✓	✓	✓			✓	✓
Borna disease			✓				
Bovine ephemeral fever			✓			✓	
Bovine genital campylobacteriosis	✓			✓		✓	✓
Bovine malignant catarrhal fever				✓		✓	✓
Bovine petechial fever			✓			✓	
Bovine respiratory syncytial virus							✓
Bovine spongiform encephalopathy	✓	✓				✓	✓
Bovine tuberculosis	✓	✓				✓	✓
Bovine viral diarrhea	✓			✓		✓	✓
Brucellosis	✓	✓			✓	✓	✓
Chlamydiosis							✓
Contagious bovine pleuropneumonia	✓	✓				✓	✓
Cysticercosis	✓					✓	
Dermatophilosis				✓			
Echinococcosis						✓	
Enzootic bovine leucosis	✓			✓		✓	✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Epizootic Hemorrhagic disease	✓		✓			✓	✓
Filariasis				✓		✓	
Foot and Mouth Disease	✓	✓				✓	✓
Heartwater	✓		✓			✓	✓
Hemorrhagic septicemia	✓			✓			
Ibaraki disease			✓			✓	
Infectious bovine rhinotracheitis	✓			✓		✓	✓
Leptospirosis	✓					✓	✓
Listeriosis				✓			
Louping ill			✓		✓		
Lumpy skin disease	✓	✓				✓	✓
Melioidosis				✓		✓	
Paratuberculosis	✓			✓		✓	✓
Pink eye							✓
Piroplasmosis							✓
Pseudorabies						✓	
Q Fever	✓			✓	✓		✓
Rabies	✓	✓			✓	✓	✓
Rift Valley Fever	✓	✓			✓	✓	
Rinderpest	✓	✓				✓	
Screwworm	✓		✓		✓	✓	
Surra	✓						
Theileriosis	✓		✓			✓	✓
Tick-borne fever						✓	
Trichomonosis	✓			✓		✓	✓
Trypanosomiasis	✓		✓			✓	✓
Vesicular stomatitis	✓	✓			✓	✓	✓
Warble infestation							
Wesselbron disease			✓			✓	
West Nile Virus							✓

ALPACA & LLAMA

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Anthrax	✓	✓				✓	
Bovine Babesiosis						✓	
Bluetongue						✓	✓
Borna disease			✓				
Bovine/caprine pleuropneumonia							✓
Bovine ephemeral fever						✓	
Bovine genital campylobacteriosis							✓
Bovine tuberculosis						✓	✓
Brucellosis	✓	✓				✓	✓
Camel Pox						✓	
Caprine arthritis/encephalitis							✓
Echinococcosis						✓	
Epizootic Hemorrhagic disease						✓	✓
Foot and Mouth Disease	✓	✓				✓	
Leptospirosis						✓	✓
Louping ill			✓		✓	✓	
Lumpy skin disease							✓
Paratuberculosis	✓			✓			✓
Peste des petits ruminants							✓
Rabies	✓	✓			✓	✓	
Rift Valley Fever							✓
Rinderpest						✓	✓
Screwworm	✓		✓		✓	✓	
Sheep and goat pox							✓
Sheep mange						✓	
Surra	✓						

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Trichomonosis							✓
Trypanosomiasis						✓	
Venezuelan equine encephalomyelitis						✓	
Vesicular stomatitis						✓	
West Nile Virus	✓		✓				

BISON

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Aino virus infection						✓	
Akabane disease						✓	
Anaplasmosis						✓	
Anthrax	✓	✓			✓	✓	
Bluetongue	✓	✓	✓			✓	
Bovine babesiosis						✓	
Bovine cysticercosis					✓	✓	
Bovine ephemeral fever						✓	
Bovine petechial fever						✓	
Bovine spongiform encephalopathy					✓	✓	
Bovine tuberculosis					✓	✓	✓
Brucellosis	✓	✓			✓	✓	✓
Contagious bovine pleuropneumonia						✓	✓
Echinococcosis						✓	
Epizootic Hemorrhagic disease						✓	
Filariasis				✓		✓	
Foot and Mouth Disease	✓	✓				✓	✓
Heartwater						✓	
Ibaraki disease						✓	
Lumpy skin disease						✓	
Malignant catarrhal fever						✓	
Melioidosis					✓	✓	
Panatuberculosis	✓			✓			
Pseudorabies						✓	
Rabies	✓	✓			✓	✓	
Rift Valley Fever						✓	

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Rinderpest	✓	✓				✓	✓
Sarcosporidiosis					✓	✓	
Schistosomiasis						✓	
Screwworm	✓		✓		✓	✓	
Surra	✓						✓
Theileriosis						✓	
Tick-borne fever						✓	
Tissue worm						✓	
Trypanosomosis						✓	
Vesicular stomatitis					✓	✓	
Wesselbron disease					✓	✓	

BEES

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Acarapisosis	✓			✓			✓
Africanisation						✓	
American foulbrood	✓			✓			✓
Chronic bee paralysis							✓
European foulbrood	✓			✓			✓
Euvarroa sinhai							✓
Fluvinate-resistant Varroa mite			✓				
Halfmoon disorder							✓
Kashmir bee virus							✓
Locustacerus buchneri							✓
Malpighamoeba mellificae							✓
Melanosis							✓
Nosematosis of bees				✓			✓
Oxytetracyline-resistant American foulbrood						✓	
Small hive beetle infestation	✓		✓			✓	✓
Tai sacbrood virus							✓
Tracheal mite							✓
Tropilaelaps infestation	✓						✓
Varroosis	✓					✓	✓

CERVIDS

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Adenovirus hemorrhagic disease						✓	
Aino virus of cervids						✓	
Anaplasmosis						✓	
Anthrax	✓	✓			✓	✓	✓
Besnoitiosis						✓	
Bluetongue	✓	✓	✓			✓	✓
Bovine babesiosis					✓	✓	
Bovine tuberculosis					✓	✓	✓
Brucellosis	✓	✓			✓	✓	✓
Chronic wasting disease		✓				✓	✓
Echinococcosis	✓			✓	✓	✓	
Epizootic Hemorrhagic disease	✓		✓			✓	
Filariasis						✓	
Foot and Mouth Disease	✓	✓				✓	✓
Heartwater	✓		✓			✓	
Herpes virus of cervidae			✓				
Leptospirosis					✓	✓	
Louping ill					✓	✓	
Malignant catarrhal fever						✓	✓
Melioidosis					✓	✓	
Paratuberculosis	✓			✓			
Peste des petits ruminants	✓					✓	✓
Q fever							✓
Rabies	✓	✓			✓	✓	

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Rift Valley Fever							✓
Rinderpest	✓	✓				✓	✓
Screwworm	✓		✓		✓	✓	
Surra	✓						
Theileriosis						✓	
Tick-borne fever						✓	
Tissue worm			✓			✓	
Trypanosomosis					✓	✓	
Vesicular stomatitis					✓	✓	
West Nile fever	✓		✓				

EQUINE

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
African horse sickness	✓	✓				✓	✓
Anthrax	✓	✓			✓	✓	✓
Borna disease			✓		✓	✓	✓
Bovine brucellosis						✓	✓
Contagious equine metritis	✓	✓				✓	✓
Dourine	✓		✓			✓	✓
Echinococcosis	✓			✓	✓	✓	
Equine coital exanthema				✓			✓
Epizootic lymphangitis						✓	✓
Equine encephalosis						✓	
Equine encephalomyelitis	✓		✓		✓		✓
Equine erhlichlosis							✓
Equine herpes virus							✓
Equine infectious axemia	✓	✓				✓	✓
Equine influenza	✓			✓			✓
Equine paratyphoid							✓
Equine piraplasmosis	✓	✓				✓	✓
Equine rhinopneumonitis	✓			✓			✓
Equine viral abortion							✓
Equine viral arteritis	✓			✓			✓
Filariasis						✓	
Getah virus infection							✓
Glanders	✓		✓		✓	✓	✓
Hendra virus			✓		✓		✓
Horse mange				✓		✓	✓
Horse pox							✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Kunjin virus							✓
Japanese encephalitis	✓		✓		✓	✓	✓
Leptospirosis	✓				✓	✓	
Louping-ill			✓		✓		
Meliodosis					✓	✓	✓
Nipah virus			✓		✓	✓	✓
Nipah virus encephalitis	✓				✓		
Paratuberculosis	✓			✓			
Rabies	✓	✓			✓	✓	✓
Salmonella abortus equi				✓		✓	
Screwworm	✓		✓		✓	✓	✓
Strangles				✓			✓
Surra	✓					✓	✓
Tetanus							✓
Trichinellosis	✓	✓			✓		
Ulcerative lymphangitis							✓
Venezuelan equine encephalitis		✓	✓		✓	✓	✓
Vesicular stomatitis	✓	✓			✓	✓	✓
Wesselbron disease			✓				
West Nile fever	✓		✓		✓	✓	✓

GOATS

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Akabane disease			✓			✓	✓
Anaplasmosis						✓	
Anthrax	✓	✓			✓	✓	✓
Besnoitiosis						✓	
Bluetongue	✓	✓	✓			✓	✓
Borna disease			✓			✓	✓
Bovine tuberculosis						✓	✓
Brucellosis	✓	✓			✓	✓	✓
Campylobacteriosis							✓
Caprine arthritis/encephalitis	✓			✓		✓	✓
Contagious agalactia	✓		✓			✓	✓
Contagious caprine pleuropneumonia	✓		✓			✓	✓
Contagious ecthyma							✓
Dermatamycosis							✓
Echinococcosis					✓	✓	✓
Emzootic abortion of ewes	✓						✓
Enterotoxemia							✓
Epizootic Hemorrhagic disease						✓	✓
Filariasis						✓	
Foot and Mouth Disease	✓	✓				✓	✓
Heartwater	✓		✓			✓	✓
Leptospirosis					✓	✓	✓
Listeriosis							✓
Louping-ill			✓		✓	✓	✓
Malignant catarrhal fever						✓	
Mange							✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Melioidosis					✓	✓	
Murrurrandi disease						✓	
Nairobi sheep disease	✓		✓			✓	✓
Nipah virus encephalitis	✓				✓		
Nipah virus			✓		✓		
Paratuberculosis	✓			✓		✓	✓
Peste des petits ruminants	✓	✓				✓	✓
Pseudorabies						✓	
Pulminary adenomatosis							✓
Q Fever	✓			✓	✓		✓
Rabies	✓	✓			✓	✓	
Rift Valley Fever	✓	✓			✓	✓	✓
Rinderpest	✓	✓				✓	✓
Salmonellosis	✓					✓	
Scrapie	✓	✓					✓
Screwworm	✓		✓		✓	✓	
Sheep & goat pox	✓	✓				✓	✓
Surra	✓						
Tick-borne fever						✓	
Transmissible spongiform encephalopathy							✓
Trypanosomosis					✓	✓	
Vesicular stomatitis	✓	✓			✓	✓	✓
Vibriosis							✓
Wesselbron disease			✓			✓	

MINK

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Aleutian disease							✓
Anthrax	✓	✓			✓	✓	
Bovine tuberculosis					✓	✓	
Brucellosis					✓	✓	
Canine distemper							✓
Influenza (A & B)						✓	
Mink viral enteritis (parvovirus)							✓
Plague					✓	✓	
Pseudorabies						✓	
Rabies	✓	✓			✓	✓	
Screwworm	✓				✓		
Transmissible mink encephalopathy					✓	✓	
Trichinellosis					✓	✓	
Trypanosomiasis					✓	✓	
Tularemia					✓	✓	

POULTRY

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Avian chlamydiosis	✓		✓				✓
Avian encephalomyelitis		✓					✓
Avian infections laryngotracheitis	✓		✓				✓
Avian infectios anemia							✓
Avian infectious bronchitis	✓			✓			✓
Avian influenza	✓	✓			✓	✓	✓
Avian leucosis				✓			✓
Avian monocytosis							✓
Avian mycoplasmosis (gallisepticum or synoviae)	✓			✓			✓
Avian pneumonvirus infection							✓
Avian salmonellosis				✓			✓
Avian spirochaetosis				✓			
Avian spirochaetosis						✓	
Avian tuberculosis				✓	✓	✓	✓
Botulism				✓			
Chigger disease							✓
Coccidiosis				✓			
Coccidiosis							✓
Colibacillosis							✓
Corona virus enteritis							✓
Derzy´s disease							✓
Duck virus enteritis				✓			✓
Duck virus hepatitis	✓		✓			✓	✓
Egg drop syndrome			✓			✓	✓
Erysipelthrix							✓
Espiroquetosis							✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Foul pox				✓			✓
Fowl cholera	✓		✓				
Fowl typhoid	✓	✓				✓	✓
Goose parvovirus infection			✓			✓	
Hemorrhagic enteritis							✓
Histomoniasis							✓
Inclusion body hepatitis							✓
Infectious bursal disease	✓			✓			✓
Infectious coryza				✓			✓
Lecocytezoonosis							✓
Listeriosis							✓
Marek's disease	✓			✓			✓
Newcastle disease	✓	✓			✓	✓	✓
Paramyxovirus							✓
Psittacosis							✓
Pullorum disease	✓	✓					
Pullorum disease						✓	
Reovirus							✓
Reticuloencotheliosis							✓
Spirochetosis							✓
Trichomoniasis							✓
Turkey lymphoproliferative disease							✓
Turkey meningoencephalitis							✓
Turkey rhinotracheitis	✓		✓			✓	✓
Turkey viral hepatitis							✓
Vibronia hepatitis							✓
Viral arthritis							✓
West Nile virus							✓

RABBITS

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Anthrax	✓	✓			✓		
Borna disease			✓				
Brucella suis							✓
Hendra virus					✓	✓	
Myxomatosis	✓			✓		✓	✓
Nosematosis							✓
Paratuberculosis	✓			✓			
Q fever	✓				✓		
Rabbit hemorrhagic disease	✓		✓			✓	✓
Rabies	✓	✓			✓		✓
Screwworm	✓		✓		✓		
Tularemia	✓			✓	✓	✓	✓

SHEEP

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Akabane disease			✓			✓	✓
Anaplasmosis						✓	
Anthrax	✓	✓			✓	✓	✓
Besnoitiosis						✓	
Bluetongue	✓	✓	✓			✓	✓
Borna disease			✓			✓	✓
Bovine tuberculosis					✓	✓	✓
Brucellosis	✓	✓		✓	✓	✓	✓
Campylobacteriosis							✓
Caseous lymphadenitis				✓			✓
Contagious agalactia	✓		✓			✓	✓
Contagious caprine pleuropneumonia	✓		✓			✓	✓
Contagious ecthyma							✓
Contagious pustular dermatitis				✓			
Dermatamycosis							✓
Distomatosis				✓			
Echinococcosis	✓			✓	✓	✓	✓
Emzootic abortion of ewes	✓			✓			✓
Enterotoxemia				✓			
Epizootic Hemorrhagic disease						✓	✓
Filariasis						✓	
Foot and Mouth Disease	✓	✓				✓	✓
Foot rot				✓			
Heartwater	✓		✓			✓	✓
Leptospirosis	✓				✓	✓	✓
Listeriosis							✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Louping-ill			✓		✓	✓	✓
Maedi-visna	✓			✓		✓	✓
Malignant catarrhal fever						✓	
Melioidosis					✓	✓	
Murrurrandi disease						✓	
Nairobi sheep disease	✓		✓			✓	✓
Ovine epididymitis						✓	
Ovine pulmonary adenomatosis				✓			
Paratuberculosis	✓			✓		✓	✓
Peste des petits ruminants	✓	✓				✓	✓
Pseudorabies						✓	
Q Fever	✓			✓	✓		✓
Rabies	✓	✓			✓	✓	
Rift Valley Fever	✓	✓			✓	✓	✓
Rinderpest	✓	✓				✓	✓
Salmonellosis	✓			✓		✓	
Scrapie	✓	✓				✓	
Screwworm	✓		✓		✓	✓	
Sheep & goat pox	✓	✓				✓	✓
Sheep mange				✓		✓	✓
Surra	✓						
Tick-borne fever						✓	
Transmissible spongiform encephalopathy							✓
Trypanosomosis					✓	✓	
Vesicular stomatitis	✓	✓			✓	✓	✓
Vibriosis							✓
Wesselbron disease			✓			✓	
West Nile fever	✓		✓				

SWINE

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
African swine fever	✓	✓				✓	✓
Anthrax	✓	✓			✓	✓	✓
Atrophic rhinitis							✓
Atrphic rhinitis				✓			
Aujeszky´s disease (Pseudorabies)	✓	✓				✓	✓
Bovine tuberculosis					✓	✓	✓
Brucellosis	✓	✓			✓	✓	✓
Chlamydiosis							✓
Classical swine fever	✓	✓				✓	✓
Contagious pleuopneumonia							✓
Echinococcosis	✓			✓	✓	✓	
Enzootic pneumonia							✓
Filariasis						✓	
Foot and Mouth Disease	✓	✓				✓	✓
Glasser’s disease							✓
Hemorrhagic septicemia							✓
Japanese encephalitis	✓		✓		✓		✓
Leptospirosis					✓	✓	✓
Louping-ill			✓		✓		
Melioidosis					✓	✓	✓
Mycoplasma hyopneumonize							✓
Nesicular stomatitis	✓	✓			✓	✓	✓
Nipah virus			✓		✓	✓	
Nipah virus encephalitis	✓				✓		✓
Paratuberculosis				✓			
Pasteurellosis							✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Peste des petits ruminants							✓
Porcine cysticercosis	✓				✓	✓	✓
Porcine reproductive and respiratory syndrome	✓			✓			✓
Post weaning multisystemic wasting syndrome							✓
Rabies	✓	✓			✓	✓	✓
Respiratory coronavirus							✓
Rinderpest	✓	✓					✓
Rinderpest						✓	✓
Salmonellosis							✓
Screwworm	✓		✓		✓	✓	
Streptococcus suis type 2							✓
Surra	✓						
Swine dysentery							✓
Swine erysipelas				✓			✓
Swine influenza							✓
Swine parvovirus							✓
Swine plague							✓
Swine vesicular disease	✓	✓				✓	✓
Teschovirus encephalomyelitis	✓		✓			✓	✓
Toxoplasmosis							✓
Transmissible gastroenteritis	✓			✓		✓	✓
Treponema hyodysenteriae							✓
Trichinellosis	✓	✓			✓	✓	✓
Trypanosomiasis					✓	✓	
Tularemia							✓

Disease	OIE Listed	Reportable	Immediately Notifiable	Annually Notifiable	Zoonotic	Program Involved	
						Import	Export
Vesicular exanthema							✓
Vibrionic dysentery				✓			
Viral encephalomyocarditis							✓
Wesselbron disease			✓				