Sampling strategies
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WHY SAMPLING?
SAMPLING FOR DISEASE DIAGNOSIS
SAMPLING FOR SURVEILLANCE & MONITORING
SEROSURVEILLANCE

CONTENT

WHY SAMPLING?
Intends to yield knowledge on the disease status of a population of concern (current and over time)
Information forms the basis for decision making and disease control in animal health
**SAMPLING STRATEGIES**

- Disease diagnosis & outbreak investigations
  - What?
- Surveillance
  - Determine disease status
  - Confirm freedom of disease
- Monitoring
  - Detect changes
- Research (analytic epidemiology)
  - Hypothesis testing (case-control and cohort studies)

The quality of the diagnosis is largely determined by the quality of the samples. (Incorrect, inadequate, putrefied and/or unidentified samples are likely to be unsuitable for analysis)

To obtain the best results, samples must be ‘fit for purpose’ and therefore:
- Taken from the appropriate tissues
- Adequate in volume
- As fresh as possible
- Clearly and legibly identified
- Preserved in such a way as to avoid deterioration
**Sampling for disease diagnosis**

- Transport of samples to the laboratory as fresh and fast as possible

**Selecting the samples**

**Animals: ideal**
- Untreated animals
- Recently ill animals
- More than one affected, in contact healthy animals
- Recently dead animals

**Samples: ideal**
- Appropriate to clinical signs/necropsy findings
- Fresh lesions
- Lesion edge (include healthy tissue)
Where history/clinical signs/necropsy findings lead to suspect diagnosis:

- Consult the laboratory for guidance in sample collection and submission

<table>
<thead>
<tr>
<th>Disease</th>
<th>Specimen</th>
<th>Preservation &amp; Packaging</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax</td>
<td>Examination of sensors, sputum</td>
<td>1) Submit smears unfixed and unstained. Wrap slides individually in tissue paper and pack between cardboard.</td>
<td>Mark container “Suspected anthrax”</td>
</tr>
<tr>
<td></td>
<td>Culture: affected tissue</td>
<td>2) Sputum in sterile container, keep cool</td>
<td></td>
</tr>
<tr>
<td>Blackquarter (Clostridium chauvoei)</td>
<td>Fluorescent antibody test: 5 smears from edge of lesion</td>
<td>1) Submit smears unfixed and unstained. Wrap slides individually in tissue paper and pack between cardboard.</td>
<td>1) 1</td>
</tr>
<tr>
<td></td>
<td>Culture: affected tissue</td>
<td>2) Sputum in sterile container, keep cool</td>
<td>2) 7-10 For culture exclude oxygen</td>
</tr>
<tr>
<td>Bovine Radiculitis</td>
<td>Ejaculate in test tube; keep cool. Use original insemination straws; keep in liquid nitrogen</td>
<td>1) Submit smears unfixed and unstained. Wrap slides individually in tissue paper and pack between cardboard.</td>
<td>1) 8</td>
</tr>
<tr>
<td></td>
<td>Milk</td>
<td>2) Sputum in sterile container, keep cool</td>
<td>2) 4-6</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>Culture for typing test to pure and uncontaminated</td>
<td>3) Milk: keep cool</td>
<td>3) 8</td>
</tr>
</tbody>
</table>

Where clinical signs/necropsy findings cannot pinpoint:

- Blood:
  - culture, haematology, blood biochemistry, blood smear

- Necropsy multiple tissues: brain, liver, spleen, kidney, lung
  - culture, impression smears, histopathology
**In living animals:**
- Blood (fever of unknown origin)
  - Whole blood
  - Serum
- Faeces
- Swabs
- Tissue biopsies
- Other (e.g. FMD:probang)

**In dead animals:**
- Tissues in formalin (histopathology)
- Fluid (abdominal, thoracic, joint, urine)
- Swabs

**Sampling for surveillance & monitoring**

- **Surveillance**: “All regular activities aimed at ascertaining the health status of a given population with the aim of early detection and control of animal diseases of importance to national economies, food security and trade”

- **Monitoring**: “All activities aimed at detecting changes in the epidemiological parameters of a specified disease”

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**Sampling Strategies**

Sampling for surveillance: objectives

- To permit early detection of exotic or new diseases
- To protect consumers of livestock products and owners of livestock and companion animals from zoonotic diseases
- To support trade in livestock and livestock products
- To evaluate disease control programmes
- To establish how important a disease really is – ranking of diseases

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Sampling for surveillance & monitoring

- Surveillance & monitoring
  - Descriptive epidemiology (survey-based)
  - Quantitative (quantify disease occurrence in a population, space and time)
  - Qualitative (presence of absence of disease)
  - Entire population or sample of a population
Sampling for surveillance & monitoring

The broader management aim (and the type of information, incl. level of detail required) determine the sampling strategy - Objectives

e.g.
- Is the disease present? (detection)
- Prevalence of disease (cross-sectional studies)
- Prevalence of infection vs disease
- Exposure vs infection

Sampling for surveillance & monitoring

Survey design

- Objectives
- Select the population sample (sampling method)
  - representative
- Sampling plan

Sampling for surveillance & monitoring

- Sampling plan

Determined by
- the disease of concern
- Endemic or exotic disease
- Nature of the disease concerned
- Diagnostic tools and performance
- Linking of surveillance activities for different diseases
**Sampling for surveillance & monitoring**

The use of diagnostic tools
- Detecting clinical signs
- Detecting the infectious agent (direct detection)
  - Culture
  - Molecular detection methods
  - Immunological methods (BSE, rabies)
- Detecting markers of infection (immune response)
  - Serum antibodies/cellular immune response

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**Sampling for surveillance & monitoring**

The use of diagnostic tools
Determined by
- Costs
- Sensitivity and specificity
- Practicality of sample collection/stability of samples
- Suitable for high sample throughput

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**Sampling for surveillance & monitoring**

- Serology as a diagnostic tool
  Measure of
  - Exposure
  - Past infection or disease and recovery
  - Seroconversion (diffusion of the agent through the population, sentinel animals)
  - Efficacy of vaccination programmes
  - Success of eradication programmes
Sampling for surveillance & monitoring

- Serology as a diagnostic tool
  - Most used way of disease surveillance in wild animals
  - Definitive test if diagnostic performance is satisfactory
  - Screening test in combination with a confirmatory test