Project: Technical assistance to improve implementation of food safety standards and disease crisis preparedness

Training course: Epidemiological investigation

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Date: ……

Place: Nicosia, Cyprus

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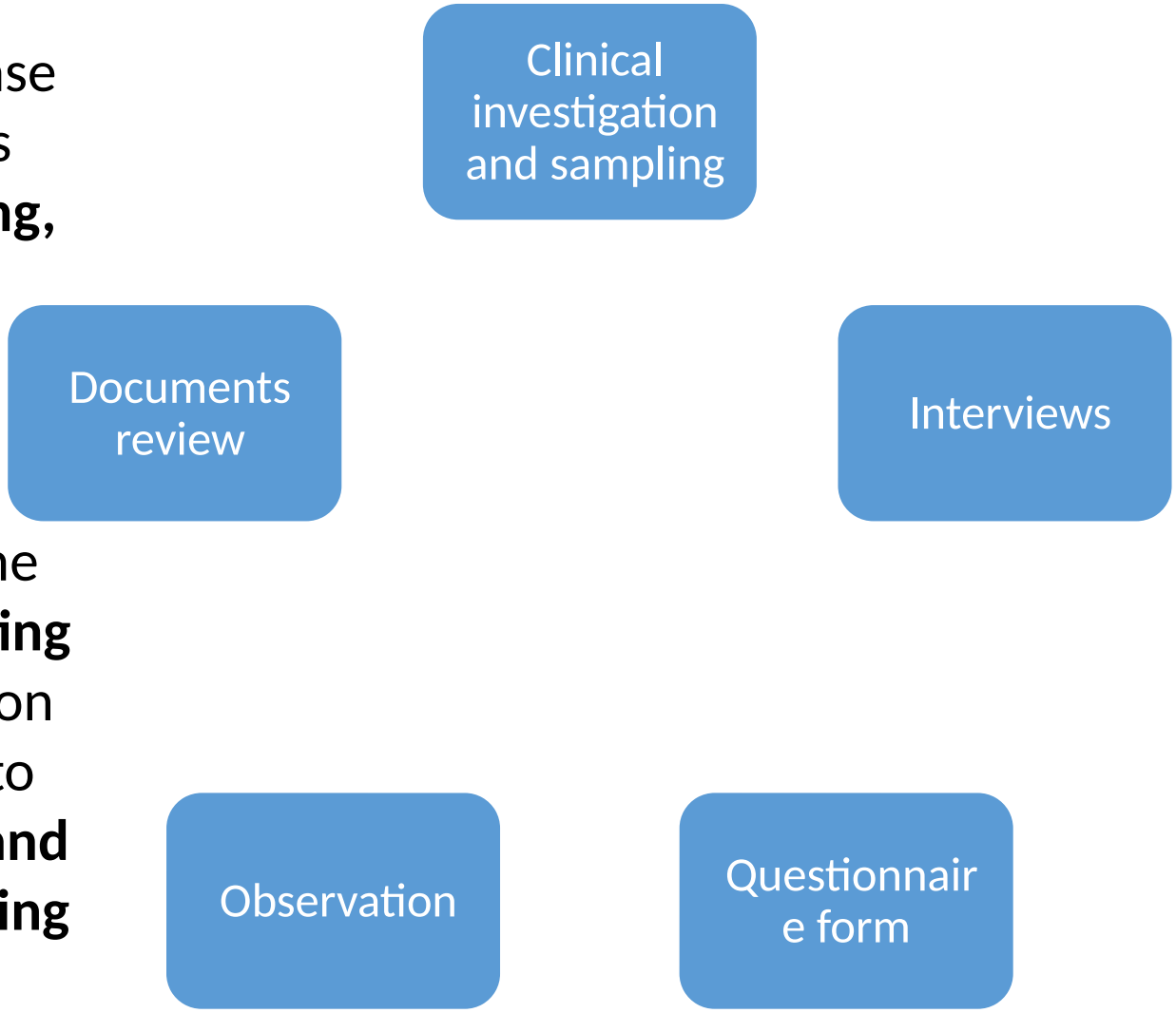
Content of the presentation

- General overview
- Purpose of investigation
- Epidemiology of the disease
- Outbreak dynamics
- Questions that need to be answered
- Elements of epidemiological investigation
  - Preparing of investigation
  - On spot investigation
  - Reporting

What is epi investigation?

Investigating an outbreak of a disease primarily involves **gathering, recording, analyzing and reporting information**. The general responsibility of the '**officials' investigating** the disease suspicion or an outbreak is to **detect the factors and circumstances leading** to the event.



Principles of disease control

1. **Stop production of virus**-slaughter infected and susceptible animals on farm
2. **Prevent spread-**trace all movements from & contacts with the farm that may have spread the disease
3. **Look for the source of disease -** backtrace movements/contacts onto the farm
4. **Surveillance**
5. **Understand outbreaks** and impose appropriate additional control measures (? vaccination, enhanced biosecurity)

ROLES FOR THE EPIDEMIOLOGIST

The purposes of investigation

- The purposes of investigation is to provide: an assessment of the **introduction** of FMD virus in a holding
- The **spread** of the virus on the holding and potential lateral **transmission** routes of the viruses from infected premises to other premises

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The reasons for investigation

The reasons for investigation can be the following which should as well be taken under consideration:

- suspicion
- contact holdings
- outbreak
- surveillance on holdings in restriction zones
- other

Epidemiology of AI - 1

- Avian influenza viruses are contagious, highly variable viruses that are widespread
- Wild birds are in aquatic habitats are primary reservoirs
- The AI viruses are divided into two main groups HPAI and LPAI
- HPAI are extremely virulent in domestic poultry and it can kill up to 90-100% of the flock
- Sporadically can infect mammals
- And some strains are zoonotic

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Epidemiology of AI - 2

- Influenza A viruses are classified into subtypes (e.g., H1N2) based on two variable surface proteins, the **hemagglutinin** (HA) and **neuraminidase** (NA)
- At least **16 hemagglutinins** (H1 to H16), and **9 neuraminidases** (N1 to N9) have been found in viruses from birds
- Influenza viruses change frequently, as the result of **mutations and gene reassortment** between viruses

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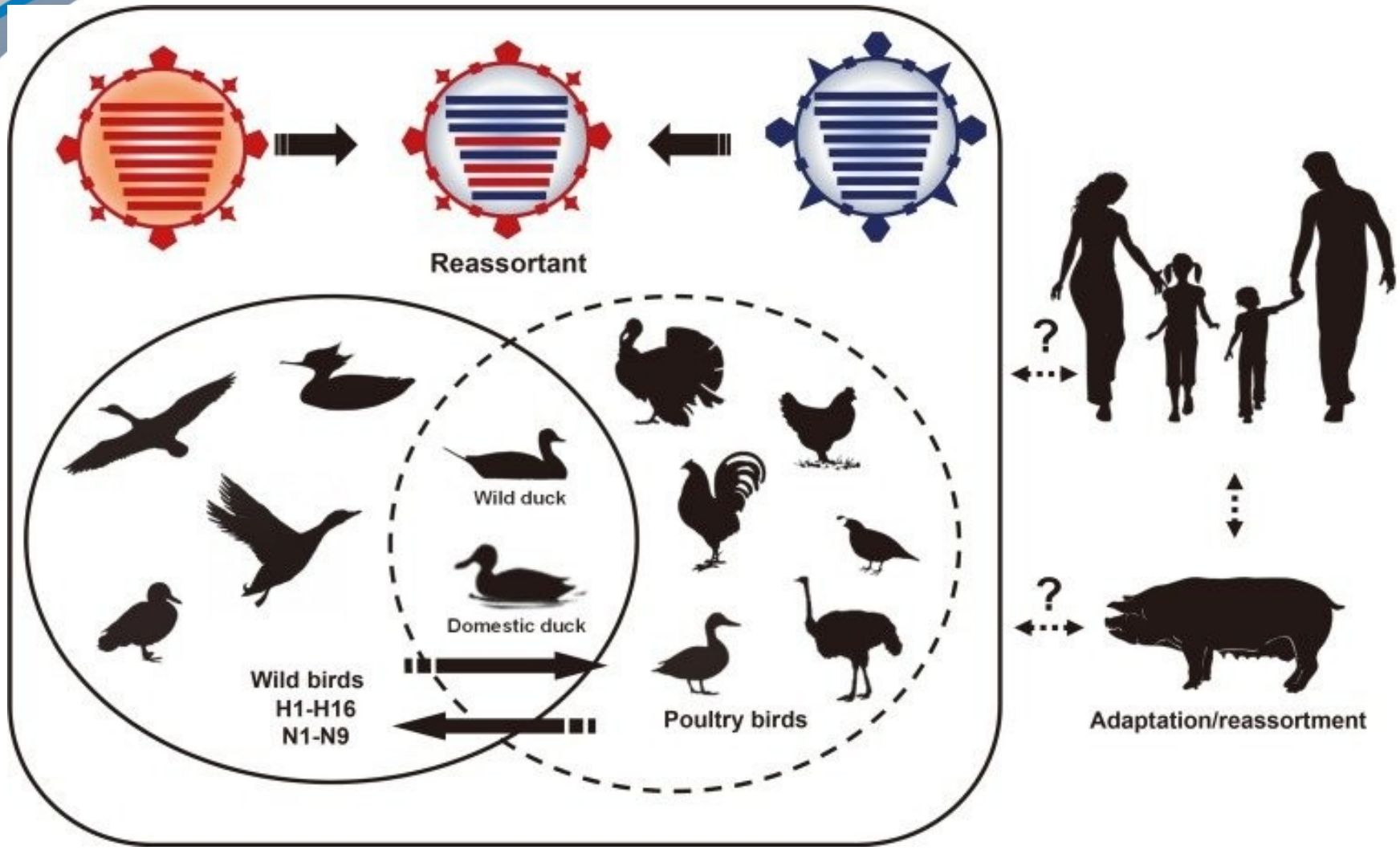
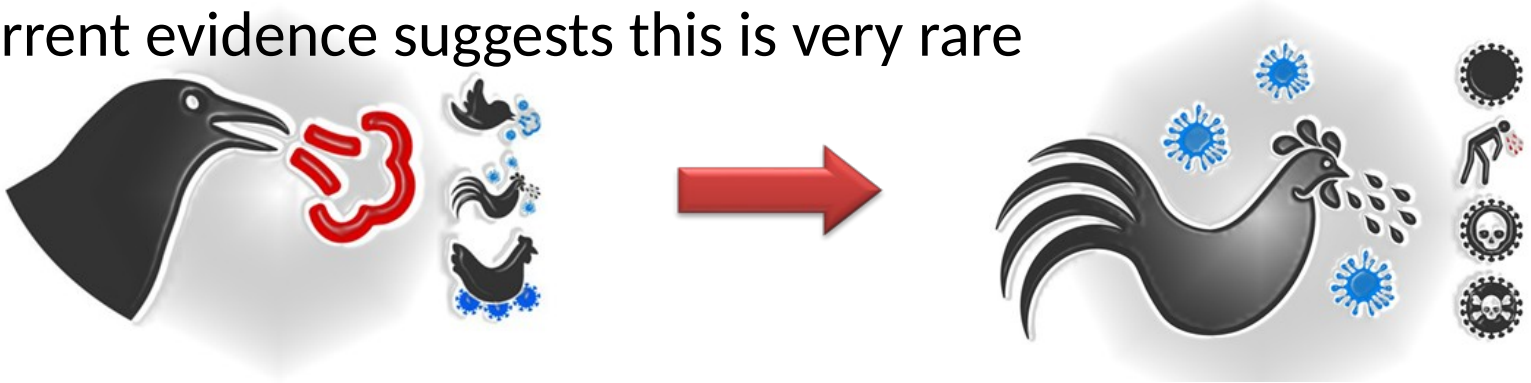
Epidemiology of AI - 3



Epidemiology of AI - 4

- Influenza A viruses are shed in the **feces and respiratory secretions** of birds, but the relative amount of virus in these two locations varies with the virus and host species
- Aquatic birds, such as waterfowl, usually shed large amounts of virus in the feces and fecal-oral transmission is usually the most important route in these birds
- In poultry flocks, avian influenza viruses can spread by both the **fecal–oral route and aerosols**
- **Fomites** can be important in transmission, and flies might act as mechanical vectors
- It might also be possible for birds to shed LPAI viruses in **eggs**, but the current evidence suggests this is very rare



Epidemiology of AI - 5

- Mammals, including humans, are usually infected with avian influenza viruses during **close contact** with infected birds or their **tissues**, though indirect contact via **fomites**
- **Respiratory transmission** is likely to be important, and the **eye** may act as an additional entry point
- Mammals usually **shed** avian influenza viruses in **respiratory secretions**
- **Fecal shedding** has also been reported **occasionally** in humans and some experimentally infected mammals
- Avian influenza viruses **typically do not seem to spread readily between mammals**

Epidemiology of AI - 6

- viruses may **remain viable** for **several weeks** to several months
- in **natural water** sources may remain viable for **only a few days** (or less) to a **few week**
- In **feces** between 15°C and 35°C, LPAI or HPAI virus persistence ranged from < **1 day to 7 days**
- at 4°C reported survival of at **least 30-40 days**
- solid surfaces and protected from sunlight, viruses were reported to persist for at least **20 days and up to 32 days** at 15-30°C
- **less than 2 days** on porous surfaces (fabric or egg trays)
- **less than 6 days** on nonporous surfaces at room temperature
- Fathers from 6 to 240 days depending on t°
- Meat up to 6 months depending on the t°

Epidemiology of AI - 7

Domestic

Sudden death

Respiratory sings

- Ocular and nasal discharge
- Coughing
- Dyspnoea
- Swelling of the sinuses and /or head

Apathy

Reduced vocalization

Reduction in feed and water intake, egg production

Cyanosis of unfeather skin, wattles and comb

Incoordination

Diarrhea

Wild (domestic waterfowl)

Mild sings of disease or

Respiratory sings

Some Asian

Lineage

- high mortality
- Neurological sings
- Greenish diarrhea
- Sudden death

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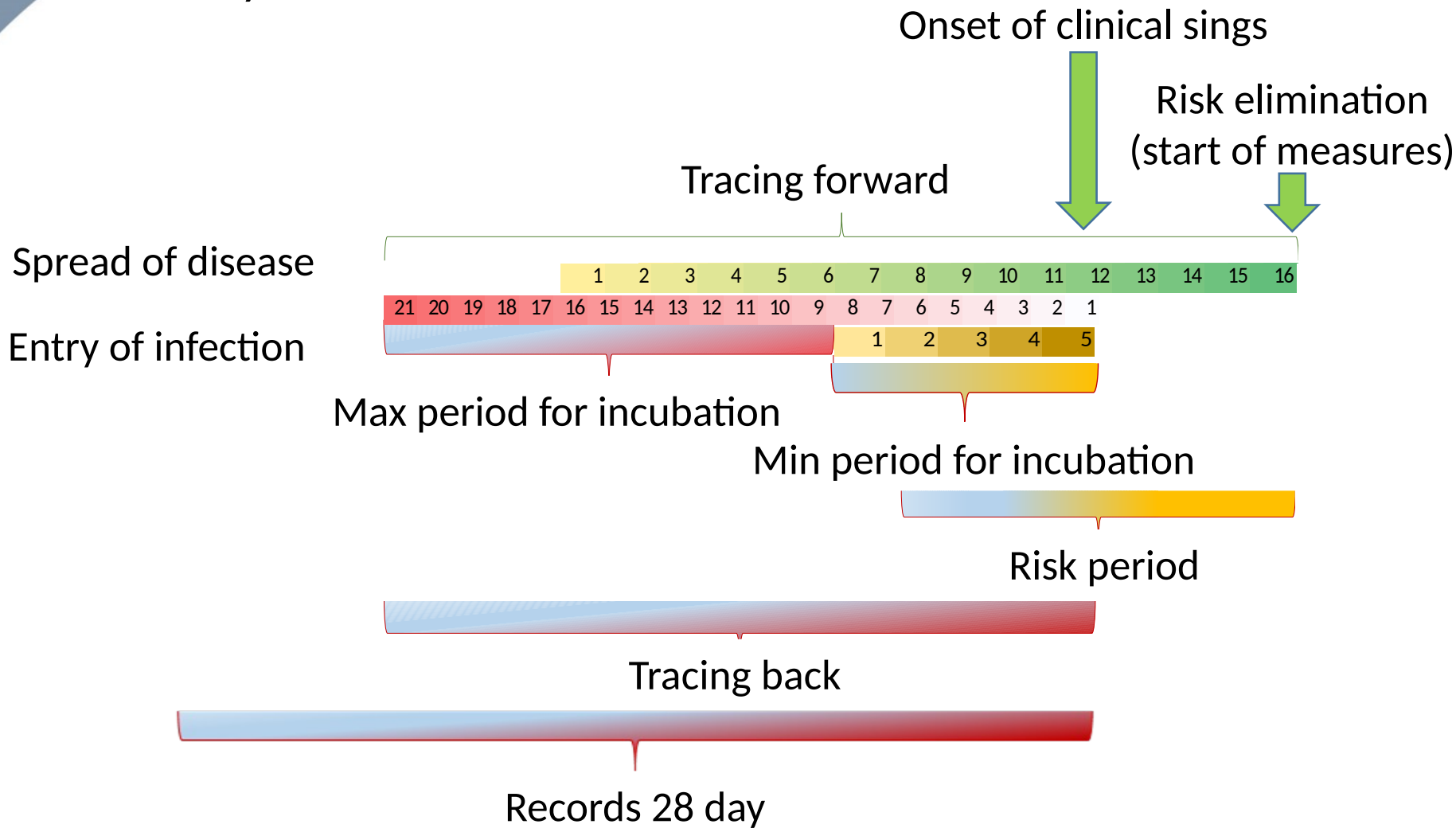
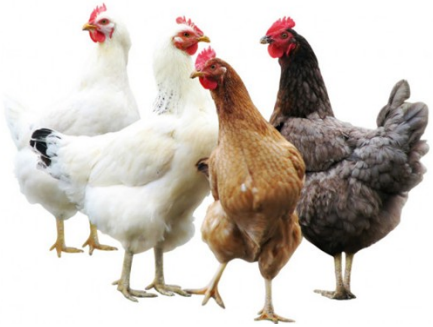
Epidemiology of FMD - 5

Outbreak dynamic

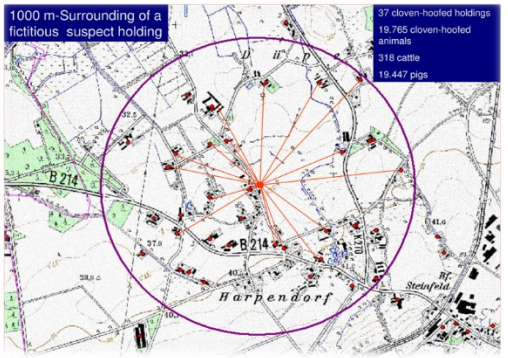


Epi investigation

To facilitate the work of the investigator use drafted forms, however, there are the main questions that require an answer



What?



When?

Where?

How?

Epi investigation

- identify the likely origin of the listed disease in question and the means of its spread;
- calculate the likely length of time that the listed disease has been present;
- identify establishments and epidemiological units therein, food and feed businesses or animal by–products establishments, or other locations, where animals of listed species for the suspected listed disease may have become infected, infested or contaminated;
- obtain information on the movements of kept animals, persons, products, vehicles, any material or other means by which the disease agent could have been spread during the relevant period preceding the notification of the suspicion or confirmation of the listed disease;
- obtain information on the likely spread of the listed disease in the surrounding environment, including the presence and distribution of disease vectors

Epi investigation

Answers to this question can be obtained by asking general or more detailed questions.
The technique for collecting questions is critical so there are provided recommendations and detailed instructions on conducting an investigation and populating the provided forms.

Epi investigation principle

In general, the epidemiological investigation divided in three parts:

1. **collecting of data and preparation for visit of the establishment**
2. **on-spot investigation and analysis of the data post-investigation**
3. **reporting**

Common ground for all three parts is providing of evidence and record keeping.

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Part 1 - collecting data

Before starting the on-spot investigation, the investigator should ensure that s/he is well prepared for field activities.

The minimum you need to consider is to take:

- PPE
- cleaning equipment
- disinfection equipment
- recording equipment (investigation forms, pens)
- other equipment you think will come useful and needed (torch, extra batteries)

Part 1 - collecting data

Before you go to establishments it is also important to collect all information available for that establishments.

This information can come from different sources:

- data base
- previous reports
- notification received, etc

Data that need to be collected on:

- location
- disease
- previous outbreaks of FMD (if it relevant)

Part 2 - On-spot investigation

On-spot investigation can take place for the purpose of the:

- suspicion or outbreak investigation
- in the holding which is restricted zones
- in contact holdings
- or for other purposes, for example before the 'official' surveillance may be lifted

Depending the type of investigation, the investigator can use form A (in case of suspicion) or form B (in case of outbreak).

Part 2 - On-spot investigation

- check of the **production and health records** of the holding, if such records exist. The daily mortality data and daily data on egg-production, and feed-and/or water intake for the period at least at beginning one week before the date of commencement of clinical signs of AI until, the date of the inspection of the holding by 'officials' which must be documented in the inspection-report
- a **clinical inspection** in each production unit, including an evaluation of its clinical history and clinical examinations of poultry or other captive birds in particular those that appear sick
- a check of records on **movement of poultry**, investigation of movement on and of the holding/establishment
- investigation of **other movement** on and of the holding
- assessment of the **biosecurity** at the holding
- collecting of **samples**

Sampling

- Clinical examination
  - with clinical sings
  - healthy animals first
- Sampling for laboratory diagnostic
  - based on the clinical examination
  - the disease profile should be considered
  - the type of samples
  - the number of samples

Reporting

The final part of the investigation is analysis of the data and drafting of report with the assumption on the possible introduction and spreading of the virus.
It is important to document details of the outbreak and the subsequent investigation and response. The outbreak investigation report is a way of communicating information about the outbreak and the effectiveness of your response to your colleagues and superiors within the veterinary ‘services’ and it will provide recorded evidence of the investigation. The report based mainly on the information gathered during the outbreak investigation, using the standard outbreak investigation form.

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Part 3 - outbreak investigation report

1. **general data** (title, date, author, outbreak No, etc)
2. **executive summary** (basic summary information about the outbreak, including details of location /state-division, district, town, village/, date of onset, date of first visit, species affected (using a table to indicate the total number of animals on the farm, the number affected, and the number dead), and the results of any laboratory tests.
3. **description of the outbreak** (a description of the outbreak and how it spread farm or village)
4. **timeline of the key events** (details about the animals affected, the time of onset)
5. **results of the on-spot investigation** (any particular information form the investigation which are not mentioned in other section)

Part 3 - outbreak investigation report

6. **overview of the tracing back and tracing forward** (as detailed as possible data on the findings and the priorities for investigation)
7. **assumption and hypothesis** (a description of your hypotheses about how the outbreak might have started and what were the most likely risk factors/risk materials involved in the introduction of the disease)
8. **measures implemented** (a description of the emergency control measures, and biosecurity measures implemented, any other measures and restriction including, to the extent possible the actions form the other involved stakeholders)
9. **conclusions, recommendations and follow-up actions** (a description of future actions that should be taken to fully control the outbreak and also to prevent future recurrence)

Part 3 - outbreak investigation report

Ideally, the outbreak investigation report should be completed as soon as possible after the initial investigation in order to keep all levels of the veterinary ‘services’ well informed.

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