



Food and Agriculture Organization
of the United Nations

Recommendations for the Epidemiological Investigation of SARS-CoV-2 Transmission to Farmed and Companion Animals in Contact with COVID-19 Infected Humans

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Recommendations for the Epidemiological Investigation of SARS-CoV-2 Transmission to Farmed and Companion Animals in Contact with COVID-19 Infected Humans

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Glossary (for the purpose of this document)

Bovine: A member of the cattle group (e.g. cattle, bison, buffalo, water buffalo, oxen, yak).

Canine: A dog or member of the dog family.

Caprine: Goat or goat-like.

Companion animals: Dogs and cats, in addition to rodents, ferrets and other **exotic pets** (see below). Service or working dogs (e.g. guide dogs, police or military working dogs) are included here.

COVID-19 patient/Infected person: A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms ([WHO, 2020](#)).

COVID-19: Name of the disease caused by SARS-CoV-2.

Cricetidae: A family of rodents that includes hamsters, voles, lemmings, and New World rats and mice.

Exotic pets: Includes less common pets, e.g. ferrets, bats and monkeys.

Equine: A horse or member of the horse family.

Feline: A member of the cat family (e.g. cat, lion, tiger, jaguar, leopard)

Farmed animals: Domestic animals belonging to poultry, rabbit, ovine, bovine, equine, camelid and swine species ([FAO, 1994](#)). Farmed mink are included here.

Mustelid: A member of the weasel family (Mustelidae), including ferrets, minks, weasels, badgers, otters, martens, and wolverines.

Ovine: Sheep or sheep-like.

Reservoir: The habitat in which the virus normally survives (= **maintenance host**) and multiplies (= **amplifying host**) without requiring repeat introduction from another species. Possible reservoir hosts include humans and wild or domestic animal species.

SARS-CoV-2: Name of the virus associated with coronavirus diseases 2019 (COVID-19).

Susceptible animals: Animals that can be infected by SARS-CoV-2, shed virus or harbor it in their tissues after efficient virus replication, regardless of showing clinical signs or not.

Wildlife: Captive wild animals and wild animals having a phenotype unaffected by human selection and living independently of direct human supervision or control ([OIE, 2019](#)).

Background

[This is slightly out of date and will be updated prior to publication]

Acknowledging the zoonotic nature of SARS-CoV-2, investigations about potential animal hosts are of great importance to the overall study of the virus and to identify susceptible animal species as well as possible transmission between humans and animals. In the ongoing COVID-19 pandemic, including environmental contamination of households with positive human cases, direct and indirect exposure of animals sharing the same space with infected humans comes as no surprise. Positive findings by detecting viral RNA in dogs ([OIE, 2020a](#); [OIE, 2020b](#)) and cats ([OIE, 2020c](#)) from households of COVID-19 patients, farmed mink ([Rijksoverheid, 2020](#)), and tigers and lions in the Bronx Zoo ([OIE, 2020d](#)), as well as the finding that 15 out of 102 (14.7%) cat sera collected from 9 owned and 6 roaming cats after the outbreak in Wuhan Province were ELISA-positive for the SARS-CoV-2 Receptor Binding Domain (RBD) ([Zhang et al., 2020](#)), have raised concerns about a possible role livestock and companion animals could play in amplification and spread of the virus. SARS-CoV-2 has also been isolated from PCR positive dogs ([OIE, 2020e](#)). Animal infection studies are ongoing in several laboratories around the world and results published so far suggest that SARS-CoV-2 replicates poorly in dogs, pigs, chickens, and ducks, but efficiently in ferrets and cats ([Shi et al., 2020](#)) and that fruit bats and ferrets are susceptible to SARS-CoV-2 infection, whereas pigs and chickens are not ([FLI, 2020](#)). Furthermore, a recent study shows that Syrian hamsters get infected with the SARS-CoV-2 and develop clinical signs ([Boudewijns et al., 2020](#)). Genome analysis strongly suggests zoonotic spillover of SARS-CoV-2 from farmed minks to human in the Netherlands (unpublished). Other studies looking at ACE-2 receptor presence in different animal species hypothesized the susceptibility of Bovidae and Cricetidae to SARS-CoV-2 ([Luan et al., 2020](#)). While these findings help restricting the range of animal species that could act as SARS-CoV-2 hosts, only field studies that are able to demonstrate viral shedding and isolate virus from several individuals of a presumed host species will be able to confirm hypotheses generated from laboratory studies. Field studies need to be undertaken now, in the short-term, while virus circulation in humans is ongoing in different parts of the world. Using a One Health approach to conduct epidemiological investigations is recommended for events where susceptible livestock, companion animals and wild animals are in close contact to confirmed human COVID-19 cases, or in situations where animals tested SARS-CoV positive in absence of information on the infection status of in-contact humans. By jointly analyzing laboratory and epidemiological information on human and animal cases collected by public health and veterinary services, so-called 4-way linking, our understanding of the epidemiology of COVID-19 and potential transmission between humans and animals will be greatly enhanced.

Purpose and objectives of the recommendations

This document has been developed by FAO in consultation with international experts for use by veterinary services or research institutions of countries with an interest in investigating SARS-CoV-2 animal infections using a One Health approach. If the recommendations are adopted widely, data collected in different countries and geographical regions can be compared and analysed globally.

The recommendations on epidemiological investigations should be used in conjunction with [OIE's](#) and FAO's SARS-CoV-2 animal sampling and testing guidance. The proposed list of potentially susceptible species to be sampled was established based on FAO's SARS-CoV-2 Exposure Risk Assessment [[provide link](#)].

Overall objective

- Investigate and describe SARS-CoV-2 infection in susceptible farmed and companion animals exposed to COVID-19 infected persons or other infected animals living in the same household, farm or other space to improve understanding of infection parameters and risk factors in field situations and adapt risk mitigation measures (see Annex 3) related to animals.

Specific objectives

- Investigate the level of infection in susceptible farmed and companion animals exposed to SARS-CoV-2 by COVID-19 infected persons or animals living in the same household, farm or sharing the same spaces.
- Describe the clinical picture of SARS-CoV-2 infection in farmed and companion animals according to species, breed, age, sex and other characteristics.
- Describe SARS-CoV-2 infection parameters observed in farmed and companion animals (incubation period, duration of infection, shedding levels, shedding routes, modes of transmission).
- Identify factors (including behaviours and practices) enhancing or reducing the exposure and spread of the infection in farmed and companion animals.

Please note that FAO does not recommend investing in extensive surveys or active surveillance for SARS-CoV-2 in animal species. Instead, these recommendations are meant to guide ad hoc One Health investigations targeting select susceptible farmed and companion animals in contact with COVID-19 patients to address above-mentioned objectives in a One Health perspective. Research studies in wild animals for identification of possible animal sources or natural reservoirs of SARS-CoV-2 are out of the scope of this document.

Arrangements before conducting the investigation

- Veterinary services should ensure that the investigation team includes personnel with adequate epidemiology and sampling skills. If needed, physical or online training should be provided prior to starting field activities.
- The investigation team should be equipped with adequate personal protective equipment (PPE; see FAO [guidance](#) – SOP9) and trained in its use, necessary sampling equipment, Standard Sampling Sheets (Annex 2) and Epidemiological Investigation Forms (Annex 1) – please see Annex 6 for a full Checklist.
- Sampling of animals should be started as soon as possible after confirmation of SARS-CoV-2 infection in the owner, otherwise the RNA shedding window in animals might be missed.
- Any measures to be taken in case of detection of SARS-CoV-2 virological material in animals (see Annex 3) should be clearly communicated to all relevant stakeholders and authorities in advance, and should be explained to owners of animals by the investigation teams prior to commencing the investigation.
- In some settings, community visits by the investigation team may be utilized to deliver public health messaging and communication materials on prevention of COVID-19 in humans to remote areas.
- Depending on the national regulations in place, an informed consent form may have to be signed by the interviewees prior to collecting information.

Methodology

Using a One Health approach, national veterinary and public health services will jointly develop and agree on the study protocol, based on the proposed methodology. The recommendations should be used as guidance, however some aspects may need to be adapted to country specific contexts, rapidly changing local circumstances as well as existing procedures and legislation. The One Health coordination mechanism, if present in the country, will play an important coordination role by facilitating timely information sharing between public health authorities, e.g. the Ministry of Health (MoH), and veterinary services, e.g. the Ministry of Agriculture/Livestock (MoA), as well as other relevant One Health partners.

- **Identification of households/farms:** The public health authorities will immediately inform veterinary services about human COVID-19 patients who are reporting regular close contact with farmed or companion animals (other than pigs and birds, which are not thought to be susceptible based on current knowledge) and are willing to contribute to the study. The public health authorities will provide basic information, including patient address, date of onset of COVID-19 symptoms, description of symptoms, farmed or companion animal species present in the household/farm or in regular contact with the patient (e.g. for farm workers, animal caretakers, etc.). To ensure availability of this information to public health authorities, national COVID-19 patient data collection forms may need to be updated in order to include questions on contact with farmed or companion animal species.

Note: In the case that animals tested SARS-CoV positive in absence of information on the infection status of in-contact humans, i.e. during routine animal health investigations by veterinary services or notification from private practice, the veterinary services will inform the public health authorities, providing information such as owner address, occupation, farmed or companion animal species present in the household/farm or in regular contact with the owner (e.g. for farm workers, animal caretakers, etc.), date of onset of clinical signs in animals, description of clinical signs, date of sampling and type of samples, date of positive test results and type of test used.

- **Selection of households/farms to be investigated:** Veterinary services should give priority to investigating households/farms with most recently confirmed human cases (within 72 hours prior to expected date of investigation). We recommend that households/farms hosting only non-susceptible animal species (i.e. chicken, ducks and pigs) are not targeted.
- **Interviewees:** If their health status allows, COVID-19 patients will be interviewed remotely through voice/video call. Other people in contact with the same animal(s) should be interviewed as well, either individually or per group interview.
- **Questionnaire:** An Epidemiological Investigation Form (see Annex 1) will be used to collect key data in a harmonized way. Only one form is to be filled for each household/farm. However, it is recommended, whenever possible, that each household/farm dwellers, employees or visitors who can get in close contact with the animals is interviewed separately. Example: if the household consists of three family members, each of them will be interviewed individually, using one form each. After verification and tri-angulation of the data collected through the three interviews, the verified data will be entered into one, final Epidemiological Investigation Form. The form is designed to capture all data necessary for global disease reporting platforms (OIE WAHIS), as well as data related to potential risk factors.

- **General veterinary inspection of animals¹:** The investigation team should not only rely on the data provided by the interviewee(s) regarding the health of their animals, however we recommend to finalize the interviews before proceeding to animal inspection and sampling; the data provided by the interviewees may guide the investigation team to select certain animal(s), target animal inspection or take specific samples. During household/farm visits for animal sampling, animal(s) should be thoroughly inspected for temperature, body condition, breathing difficulties, gastro-intestinal symptoms, lymph node swelling, conjunctival congestions/lesions and oral lesions. Suitable animal restraining equipment should be provided to the investigation team. The Epidemiological Investigation Form (see Annex 1) will facilitate inspections and ensure data on animal health is collected in a harmonized way.
- **Sample collection from animals:** Animal sampling will be performed by the investigation team which may consist of veterinary epidemiologists and/or laboratory specialists, depending on the arrangements in the region and the technical capabilities of the staff. The Epidemiological Investigation Form for animals will be used (Annex 1), in addition to the Standard Sampling Sheet (Annex 2) that is routinely used for individual animals to be sampled. The minimum set of samples to be collected from live animals include deep nasal swab, throat (oropharyngeal) swab, rectal swab and blood. NOT suitable are faecal and vomitus samples or swabs of the animal's coat/fur or other environmental swabs due to the potential for environmental contamination by the infected human. Depending on clinical signs observed, additional samples should be taken as follows:
 - Conjunctival swab in case of lacrimation or eye lesions
 - Milk in case of lactating females (for livestock)
 - Foetal fluids or embryo specimens in case of abortion or premature birth
 - Lymph node aspirate in case of superficial lymph node swelling
 - Whole blood (on anticoagulant) in case of fever

Note: Necropsies of animals suspected to be infected with SARS-CoV-2 are not recommended to be performed in the field, especially in conditions where resources are inadequate to conduct hygienic disposal and decontamination. However, if recently dead animals can be safely delivered to a laboratory, post-mortem specimens from upper and lower respiratory tissues are recommended, in addition to any other organs(s) with gross lesions.
- **Laboratory testing:** SARS-CoV-2 RNA detection should be based on standardized, validated reverse transcriptase polymerase chain reaction (RT-PCR) or equivalent assay. Further studies on PCR positive specimens by conducting gene sequencing and virus isolation (especially from specimens with important/distinct changes in the RNA sequence) are strongly recommended. The sera should be tested with reliable serological assays specific for SARS-CoV-2, whenever available. In case samples test positive for virus RNA according to the criteria defined in the [OIE case definition](#), repeat sampling of the individual animal and other animals in the same household/farm is recommended (at a minimum every 4 to 7 days, but more frequent testing when possible, as this will help to advance the understanding of how long infected animals can test positive), ideally until negative PCR results are obtained.

¹ Please see guidance on personal protective equipment (PPE) here: <http://www.fao.org/3/a-i2364e.pdf> (SOP9)

To remain available for additional studies to be performed in national or international laboratories, samples with positive or inconclusive results should be stored in a manner ensuring their integrity and traceability.

- **Presentation of laboratory results:** RT-PCR and serology results should be reported both qualitatively (positive, negative, inconclusive) and quantitatively, i.e. threshold cycle (Ct) value for RT-PCR and titre / optical density (OD) for serology (or other means, depending on the assay used).
- **Data entry:** An excel database or google form with automated export to excel will be set up² by the dedicated department in the veterinary services to enter the data collected. If more than one Epidemiological Investigation Form (see Annex 1) is used in the interview process, the investigation team will combine and summarize the answers into one form to be entered for each household/farm. If contradictory answers were provided by interviewees from the same household/farm efforts should be made to verify the information through follow up calls or repeat interviews.
- **Data analysis and reporting:** Data should be analysed according to variables outlined in Annex 3. A summary report with conclusions should be written for each investigated event (see Annex 5 for an outline of the Epidemiological Investigation Report). Even if animal infection with SARS-CoV-2 is not a notifiable disease in your country, any positive test results in animals and the associated outbreak investigation findings should be communicated and shared within the national One Health coordination mechanism and with the international scientific community (e.g. through publication).

² Please note that FAO can assist in setting this up, upon request

Annex 1. Epidemiological Investigation Form (2 pages)

Epidemiological Investigation Form									
Date:/...../.....		Type of interview: <input type="checkbox"/> Individual <input type="checkbox"/> Group (indicate number of people)							
Interviewee/s: <input type="checkbox"/> Patient		<input type="checkbox"/> others (specify relationship with the patient and role in the household)							
Human patient data (collected from PH authorities, patient/s and/or cohabitants)									
1. Interviewee name				2. Address (site of investigation)					
3. Family size	<input type="checkbox"/> Patient alone <input type="checkbox"/> specify No.			4. Family cluster of infection	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA				
5. Number of infected family members				6. Clinical status of patient/s	<input type="checkbox"/> Asymptomatic () <input type="checkbox"/> Symptomatic ()				
7. Isolation place	<input type="checkbox"/> In the family's house <input type="checkbox"/> Hospital			8. Starting date of isolation/...../..... <input type="checkbox"/> NA				
9. Date of first clinical sign/s observed/...../.....			10. Date of first laboratory confirmation / type of test used	<input type="checkbox"/> PCR/...../..... <input type="checkbox"/> virus isolation <input type="checkbox"/> serology				
11. Patient/s occupation/s				12. Type (and species) of in-contact animal/s prior to symptom/s onset	<input type="checkbox"/> Wildlife (.....) <input type="checkbox"/> Companion (.....) <input type="checkbox"/> Farmed (.....)				
13. Location of potential patient exposure from animals (if applicable)	<input type="checkbox"/> market <input type="checkbox"/> farm <input type="checkbox"/> house <input type="checkbox"/>			14. Date of last visit to the location specified in question 13 before symptom/s onset/...../.....				
Data on animal/s living in the patient's <input type="checkbox"/> household <input type="checkbox"/> farm <input type="checkbox"/> other:.....									
15. Species present*	<input type="checkbox"/> Feline	<input type="checkbox"/> Canine	<input type="checkbox"/> Bovine	<input type="checkbox"/> Ovine/ Caprine	<input type="checkbox"/> Equine	<input type="checkbox"/> Mustelids	<input type="checkbox"/> Cricetidae
16. Number of animals									
17. Breed of animal(s)									
18. Medications or vaccines currently or recently used (over the past 4 weeks)									
19. Underlying health issues				20. Sex (specify number in case of having > 1 animal)	<input type="checkbox"/> Male () <input type="checkbox"/> Female ()				
21. Animal health status 14 days prior to owner infection	<input type="checkbox"/> Mortality <input type="checkbox"/> Sick <input type="checkbox"/> Apparently healthy			22. Physiological status of females (specify number in case of having > 1 animal)	<input type="checkbox"/> Gravid () <input type="checkbox"/> Lactating () <input type="checkbox"/> NA				
23. Clinical signs (specify number of animals)	<input type="checkbox"/> Asymptomatic () <input type="checkbox"/> Symptomatic ()			fill Standard Sampling Sheet (Annex 2) for details**					
24. Date of onset of clinical signs/...../..... <input type="checkbox"/> NA			25. Date of full recovery (or death)/...../..... <input type="checkbox"/> NA				

26. How many animals (by species) are affected? (.....) <input type="checkbox"/> NA (.....) (.....)	27. For how long have the animals present been owned by the patient?	
28. Date of sampling	.../.../.....	29. How many animals were sampled (by species)? (.....) (.....) (.....)
Movement tracing			
30. Date of last visit to veterinary clinic or visit by vets	.../.../..... <input type="checkbox"/> NA	31. Date of last introduction of new animals (any species)	.../.../..... <input type="checkbox"/> NA species
32. Do you allow your animals to roam freely outside the household/ farm?	<input type="checkbox"/> Yes <input type="checkbox"/> No	33. If yes, specify the date of last interaction with other animals outside the household	.../.../..... <input type="checkbox"/> NA
34. Did your animals visit a public place (markets, pastures areas, etc.) up to 14 days prior to the confirmation of the owner's infection?	<input type="checkbox"/> Yes <input type="checkbox"/> No	35. If yes. Specify the preventive measures taken upon their return	<input type="checkbox"/> Isolation /quarantine Other: <input type="checkbox"/> No action
36. Animal rearing/housing place	<input type="checkbox"/> Backyard <input type="checkbox"/> Household <input type="checkbox"/> Farm <input type="checkbox"/>		
Risk behaviour and practices (companion animals)			
37. Animal-owner interactions	<input type="checkbox"/> Licking <input type="checkbox"/> Sniffing <input type="checkbox"/> Pawing <input type="checkbox"/> Other	38. Owner-Animal interactions	<input type="checkbox"/> Kissing <input type="checkbox"/> Sharing bed/sofa <input type="checkbox"/> Sharing food <input type="checkbox"/> Sharing kitchen or other utensils <input type="checkbox"/> Other
Notes			
.....			
Interviewee name: email Tel			
Interviewee name: email Tel			
Interviewee name: email Tel			
Interviewee name: email Tel			
Names of investigation team members			

*See Glossary for description **Such as fever, coughing, difficulty breathing or shortness of breath, lethargy, sneezing, nasal discharge, ocular discharge, vomiting, diarrhoea

Annex 2. Example Standard Sampling Sheet for animal disease surveillance (to be used together with the Epidemiological Investigation Form)

Standard Sampling Sheet for Animal Disease Surveillance											
Date/...../.....		County		District		Village/township		Latitude.....		Longitude	
Owner name/Tel				Surveillance method <input type="checkbox"/> Active, randomized <input type="checkbox"/> Active, risk-based <input type="checkbox"/> Passive <input type="checkbox"/> Syndromic <input type="checkbox"/> Other							
Site: <input type="checkbox"/> Farm <input type="checkbox"/> Household <input type="checkbox"/> Market <input type="checkbox"/> Abattoir <input type="checkbox"/> Other (.....)				Animal species present:							
No. of animals on date of disease onset				No. of dead animals since disease onset				No. of sick animals on date of visit			
<small>(not applicable in abattoir, market)</small>				<small>(not applicable in abattoir, quarantine, market)</small>							
Animal ID	Species	Sex		Age (in months)	Clinical signs (type the corresponding NUMBER) 1.no signs 2.death 3.fever 4.lethargy 5.shortness of breath 6.coughing 7.sneezing 8.nasal discharge 9.other resp. signs 10.ocular lesions 11.ocular discharge 12.vomiting 13.diarrhoea 14.other GIT signs 15.oral lesions 16.neurological signs 17.other (.....)	Date of onset for clinical signs	Sample type ⁽⁴⁾				
		Male	Female				B	N	R	T	Other*
					/...../.....					
					/...../.....					
					/...../.....					
					/...../.....					
					/...../.....					
					/...../.....					
					/...../.....					
					/...../.....					
					/...../.....					

Sample code = Animal ID. Sample type (1) B=Blood, N=nasal swab, R=rectal swab, T=throat swab *Other: (specify in the corresponding cell in the table)

Notes:

Reporting officer(s): Tel:

Annex 3. Guidelines for database design and data analysis

- An Excel database should be provided including all variables mentioned in the questionnaire and Epidemiological Investigation Form, with drop down menus for categorical variables.
- Calculation of additional variables:
 - Interval (days) between onset of symptoms in the human patient (if any) and clinical signs in the animal(s) (if any): this variable is important to approximate the incubation period in animals.
 - Interval (days) between onset of symptoms in the human patient and recovery of animal(s) (turning PCR negative), this is important to approximate the duration of infection and shedding in the animal(s).
 - Interval (days) between onset of symptoms in the human patient and sampling of the animal(s): this variable is important to understand duration of shedding and may help explaining situations where an animal tests serologically positive but PCR negative, likely due to delayed sampling.
 - Interval (days) between onset of clinical signs in animals and interaction with other animals (foreign to the household or recently introduced), this in addition to other variables will help investigating potential modes and direction of SARS-COV-2 transmission to animals.
 - Interval (days) between date of laboratory result of the human patient and sampling of the animal(s), this will help interpreting findings, e.g. when an animal tests positive in serology but negative in PCR due to late sampling.
 - Interval (days) between date of human patient isolation and onset of clinical signs in animals: this will help in interpreting the investigation results and to describe the possible mode of virus transmission to animals (direct vs indirect contact).
- The data will be summarized using pivot tables to show number and proportion of infected and non-infected animals against all variables of interest.
- The final narrative report of each household investigation should clearly address the specific objectives of the study as outlined further up. A template report structure is provided in Annex 5.
- If a representative number of cases is investigated in a given epidemiological unit (= targeted village or city), the final narrative report of the aggregated investigation data could include epidemiological tools of relative risk, measures of association and regression analysis.

Note: Both positive and negative results of animals tested should be communicated to all participants interviewed in the household/farm, including any necessary measures or follow-up actions (e.g. re-testing of positive animals). See Annex 4 for recommendations on measures to take if animals test positive.

Annex 4. Mitigation measures recommended in case SARS-CoV-2 genetic material is detected in animals

Recommended mitigation measures include:

- Isolation of infected animals or herds by banning movement outside the premises and preventing introduction of any new animals until affected animals test negative in PCR (see below).
- Minimize human contact with infected animals. When taking care of the animals, wear a mask or cloth face covering, gloves and wash your hands before and after interacting with them.
- Re-test affected animals every 4-7 days until PCR results are negative, then the isolation may be lifted.
- Conduct cleaning and disinfection of the infected premises.

Note: Confirmation of animal infection by virus isolation and/or serology is essential, beyond positive PCR (please refer to [OIE's](#) and FAO's SARS-CoV-2 animal sampling and testing guidance).

Considering that:

- There is insufficient evidence to date about any potential role livestock or companion animals could play in spreading COVID-19 to humans; the only instance where human infection from animals is thought to have happened involved a mink farm in the Netherlands (unpublished).
- The risk of zoonotic spill over, if evidenced at a later date, can be effectively mitigated through application of appropriate measures.

Culling or abandoning of animals testing positive for SARS-CoV-2 is neither recommended nor justified.

In addition:

- The culling process would un-necessarily increase the exposure of people to the virus, if present.
- The culling would un-necessarily increase economic losses of governments and communities, and subject the livelihood of people to un-necessary strains.

Annex 5. Proposed contents of the Epidemiological Investigation Report

- **Title:** will include the term “investigation”, the agent “SARS-CoV-2”, the affected/investigated population (i.e. animal species), investigated place (i.e. farm, household, other) and date (or time frame).
- **Reported by:** indicate the names of the investigation team members
- **Date written:** date of completing the investigation report.
- **Distribution list:** to whom the report will be communicated (should include relevant offices in both veterinary services, public health authorities and other relevant ministries if any)
- **Narrative report:**
 1. **Executive summary** (1-2 pages): includes a brief event description, objectives of the investigation, results and recommended actions.
 2. **Historical background:** provides details on the notification date and COVID-19 patient data provided by the public health authorities, in addition to the date and place of the investigation conducted by the veterinary services.
 3. **Objectives:** as indicated in the FAO Recommendations or the country specific plans
 4. **Methodology:** includes data on who was interviewed, method used for the interview (face to face, through voice/video call), details on inspection of animals and sampling process.
 5. **Timeline/chronology of epidemiological events:** includes dates (in ascending order) of (i) patient exposure to animals prior to symptom/s onset (if any), (ii) onset of clinical signs in patient and animals, (iii) patient isolation, (iv) patient’s full recovery or death, (v) animal death (if any), (vi) animal movement (as described in the Epidemiological Investigation Form (Annex 1).
 6. **Timeline of the One Health metrics:** includes dates (in ascending order) of : (i) onset of symptom/s in patient, (ii) patient sampling by public health authorities, (iii) lab confirmation of patient infection, (iv) public health authorities sharing information with veterinary services, (v) epidemiological investigation by the veterinary services, (vi) animal sampling by veterinary services (vii) laboratory results for animal/s including follow up testing if any, (viii) veterinary services sharing the results with public health authorities, (IX) interventions conducted (if any, for example decontamination or isolation).
 7. **Descriptive findings:** includes detailed description of the investigated site, animals in contact with the patient/s including species, numbers, age, sex and clinical picture observed, type and number of samples collected and laboratory involved in testing the samples.
 8. **Analytical findings:** as described in Annex 3 ‘Guidelines for database design and data analysis’.
 9. **Conclusions:** should be in compliance with the objectives.
 10. **Recommended actions:** both specific mitigation measures (see Annex 4 for guidance) for the investigated case or recommendations for improvement of further/future investigations.

Annex 6. Checklist for conducting the epidemiological investigation of SARS-CoV-2 transmission to farmed and companion animals in contact with COVID-19 infected humans

When	Check	Items to be checked
Before moving to the field	<input type="checkbox"/>	Enough sets of PPEs
	<input type="checkbox"/>	Enough sampling kits (for swab and blood collection)
	<input type="checkbox"/>	Cold chain device(s) have enough capacity to keep the collected samples.
	<input type="checkbox"/>	Appropriate animal restraining devices
	<input type="checkbox"/>	Enough copies of the Standard Sampling Sheet (Annex 2)
	<input type="checkbox"/>	Enough copies of the Epidemiological Investigation Form (Annex 1)
	<input type="checkbox"/>	Indelible pens for sample coding and pens for filling out the sheets/forms
	<input type="checkbox"/>	Contact the patient of the patient's cohabitants by phone to arrange for the timing of the animal sampling
During the field investigation	<input type="checkbox"/>	Wearing PPE
	<input type="checkbox"/>	Start with the interviews and fill the Epidemiological Investigation Form (Annex 1) (DO NOT start with sampling)
	<input type="checkbox"/>	Inspection of each live animal before sampling (including body temperature)
	<input type="checkbox"/>	Collect samples from sick or freshly dead animals (to be done after sampling live animals)
	<input type="checkbox"/>	Collect at a minimum deep nasal swab, throat (oropharyngeal) swab, rectal swab and blood
	<input type="checkbox"/>	Collect additional samples if specific lesions or signs are observed
	<input type="checkbox"/>	Code the samples and fill the Standard Sampling Sheet
	<input type="checkbox"/>	Remove and safely dispose of the PPEs
After the investigation	<input type="checkbox"/>	Deliver the samples to the concerned laboratory
	<input type="checkbox"/>	Enter the data collected and the laboratory results in the excel database (Annex 3)
	<input type="checkbox"/>	Communicate the results to the relevant offices/authorities (including public health authorities)
	<input type="checkbox"/>	Communicate the results to the patient/owner of the animal(s)
	<input type="checkbox"/>	Write the Epidemiological Investigation Report (Annex 5)