Deliverable

D-JRP21-FBZ3.1-BIOPIGEE-WP1.13

Twelve Month Report 2021

Workpackage 1

Responsible Partner: BfR (DE)

Contributing partners: SVA (SE), NVI (NO), VFL/EMU (EE), RKI (DE), APHA (UK), WBVR/UU (NL), ANSES (FR), AGES/VMU (AT), PIWET (PL), VRI (CZ), NDRVMI (BG), ISS, IZSAM, IZSLER (IT), RIVM (NL)

GENERAL INFORMATION

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DOCUMENT MANAGEMENT

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Project Acronym	**JRP21-FBZ3.1-BIOPIGEE**
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BIOPIGEE
Project report 2nd year

Objective

The report of the second BIOPIGEE project year (12 Month Report) was produced in WP1-T3 "Provision of project deliverables and reports" in order to inform about the progress in the BIOPIGEE project (Deliverable D-JRP21-WP1.13 "Project report 2nd year").

Content

BIOPIGEE - 12 MONTH REPORT Y4 (2021)

1. Summary of the work carried out

The OHEJP BIOPIGEE project aims to identify effective and cost-efficient biosecurity measures to control hepatitis E virus (HEV) and *Salmonella* occurrence in European pig farming. These two pathogens represent important zoonotic organisms that are difficult to detect and control on a pig farm. To achieve this, nineteen partner institutes from 12 countries are carrying out together comprehensive literature reviews, field and experimental studies, expert surveys and risk modelling (organised in Workpackages, WP). The collated information will be disseminated to stakeholders (farmers, veterinarians, advisors) in illustrations, a support tool and workshops. BIOPIGEE has been successfully running since January 1st 2020:

WP1: The BIOPIGEE Mid-term meeting took place as a virtual 2-day-event in March 2021. Collaborations with other projects were initiated and realised. A new task defined 'biosecurity measures' to harmonise understanding across project tasks. The data management plan was updated following advice from the DMP group. Several changes in the project plan were coordinated to cope with consequences of the COVID-19 pandemic. A 6-month-extension of the project was requested in agreement with all partner institutes.

WP2: A BIOPIGEE biosecurity questionnaire was applied in farms of several partner countries. This task was half a year delayed due to the pandemic situation but is now complete with questionnaires collected from 262 farms. A slaughterhouse online survey on best biosecurity practice was designed and carried out in seven participating countries (DE, CZ, EE, IT, AT, UK and NL). Sampling methods for slaughterhouses were agreed and bacteriological samples collected from two slaughterhouses (in CZ, IT). Longitudinal field studies are heavily affected by the pandemic but were initiated (in UK, IT, NL).

WP3: A HEV infectivity assay was developed successfully to be used to detect infectious HEV in samples of different origin. It may be included in a method for assessing the persistence of infectious HEV in surface samples. A method on how to test effectivity of disinfectants using the HEV infectivity assay and the method for testing persistence of infectious HEV in surface microlayers were established. *Salmonella* isolates for testing were selected. The comparison of methods and planning of how to test effectiveness of disinfectants is ongoing.

WP4: Pig movement data were obtained from UK and France, but considerable work was needed to work around data privacy issues with the UK data and they could not be fully integrated in the time available. It was not possible to obtain movement data from Italy or Germany in time. Draft results of the network model with the French data have been produced, including simulations of some on-farm biosecurity interventions. Despite delays due to staff resourcing and COVID-19, work is underway to adapt the previous *Salmonella* QMRA for HEV and integrate the network model with the QMRA.

WP5: The catalogue of biosecurity measures to reduce HEV and *Salmonella* prevalence was revised to ensure consistent data and safe updates. A systematic literature review and meta-analysis on the effectiveness of biosecurity measures against *Salmonella* and HEV in pig farms were carried out. In addition, literature on pathogenic *E. coli* was studied to complement knowledge about *Salmonella* based on the similarity of the pathogens. An expert panel from T2.1 (scientists) was expanded to incorporate knowledge of also e.g. practitioners, advisors.

The panel assessed relevance of biosecurity measures to reduce *Salmonella* and/or HEV in pig herds in an online survey (T5.4). Results were analysed.

WP6: Illustrations of examples for good biosecurity were collected at our web group from WP2. Planning of workshops was amended due to the pandemic, physical conferences were cancelled. For the first workshop, national events serve to report and discuss project results with stakeholders. The second workshop was a web meeting between the project group and the expert panel from T5.4. A relevant conference for hosting the third workshop was identified and its organisation is ongoing. A BIOPIGEE glossary was developed.

2. Work carried out in the JRP/JIP, scientific results and integrative outcomes

WP1 Project coordination and integration of results (M25-M54)

The project management, development of data management and provision of project deliverables and reports are ongoing tasks until the end of the project.

JRP21-WP1-T1- Project management and meeting organisation (M25-60)

The BIOPIGEE Mid-term meeting took place virtually on 2nd/3rd March 2021 (organised with APHA) where all WPs and Tasks presented their work, results, challenges and further plans which were discussed with the group. Four quarterly WP leader meetings and collaborations with other projects and institutions were arranged. An online glossary of relevant terms in BIOPIGEE has been developed between task groups in cooperation with the MATRIX project. The BIOPIGEE website, shared documents (uploaded to the BfR Knime server) and data reports from a survey-tool for T2.2 have been continuously managed. The change of leadership in WP4 was accompanied to guarantee a smooth hand over of coordinating tasks. Since several tasks of the project are affected by the pandemic situation (farm visits, lab work, workshops), changes in the timeline of tasks and consequences for links between Tasks/WPs were coordinated. The Gantt Chart and list of due dates for deliverables and milestones was modified accordingly. In agreement with all project partners, despite budgetary consequences, a 6-month-extension of the project was requested (April '21) in order to enable fulfilment of planned tasks. The work plans of all WPs for Y5, 2022, have been modified together with WP-leaders taking a 6 months extension into consideration. The deputy project leader, Veit Zoche-Golob left BfR and the BIOPIGEE project and his support with the publication management was transferred to the project leader Elke Burow for transitional supervision.

JRP21-WP1-T1-ST1 Definition of biosecurity measure (M39-50)

The new subtask "Definition of 'biosecurity measure' across WPs/Tasks in BIOPIGEE" (T1.1.1) was identified and initiated. The group developed a common understanding of 'biosecurity measure' across project tasks based on applied inclusion/exclusion criteria from five BIOPIGEE task groups and a literature scoping review including four scientific databases. The definition proposal will be presented via a poster at the ONE-Health, Environment, society-2022 conference. In addition, an article manuscript presenting and discussing the definition in detail is in preparation.

JRP21-WP1-T2-Development of data management plan (M25-60)

A draft of the data management plan (DMP) was developed with WP leaders and entered into the CDP-tool in 2020. From the CDP-tool, an excel sheet of the DMP was downloaded, uploaded to the BIOPIGEE website and transferred to a shared document hosted at the BfR-server (link in FORUM at the BIOPIGEE website). Updates made by WP leaders in the shared document in June, August, October and December 2021 were transferred to CDP.

New options to describe complex datasets with multiple choice for species and matrices were considered together with the option to split data sets as was informed in a training session by the DMP group in March 2021. Also contact information, keywords, description and kind of file were updated for each data set as suggested by DMP group during 2021. The DMP will be updated repeatedly until the end of the project.

The DMP includes 21 different kinds of datasets which are closely related to deliverables of the project. It is research data and methodologies, mainly related to pigs as focused in the project. Most of the data are intended to be published in scientific journals and are therefore confidential until publication. Location, where to find the data (e.g. website, Zenodo) is listed together with information whom to contact for each dataset (names, institutions and email addresses), which have a unique identifier in the plan. There is little to consider for ethical aspects as data will be anonymised and no personal or identifiable data will be included. Data related keywords from ORION were selected on a drop down list in the CDP tool and included. Thereby, the plan takes into account the following aspects: data summary, making data findable, making data openly accessible, making data interoperable, increase data re-use (FAIR data principles), data dissemination, data security and ethical aspects.

JRP21-WP1-T3-Provision of project deliverables and reports (M25-60)

The publication plan for the project, arranged in a shared document, was modified to indicate the status of publications (intended, in work, submitted, accepted, published) for WP2-5 and is being continuously managed. Here also references and links of finalised publications are collated. Deliverables are getting continuously collected and distributed (uploaded to the private web-group and to Zenodo). Reporting is a repeated task. The AWP-Y5 was amended together with the WP leaders, considering a 6-months-extension, was submitted to OHEJP coordination team (9th June 2021) and was silently accepted (without any comments) by the OHEJP coordination. The 9M-report 2021 was prepared together with the WP leaders.

WP2 Biosecurity effectiveness studies

JRP21-WP2-T2- Application of the biosecurity protocol (M27-M48)

Although COVID-19 restrictions had a large impact on the progress of the task, as of 1st December 2021, all of the planned farm visits (262) had taken place and questionnaires uploaded onto the electronic data capture system from nine countries (DE, NL, CZ, PL, BG, UK, AT, IT, EE) with additional data provided by two other countries (SE and FR). Almost 4,000 samples were collected from field visits and tested for *Salmonella* and hepatitis E virus (HEV), with additional data provided from national *Salmonella* monitoring, to help categorise farms as being at high or low risk for these pathogens. Analysis is being completed to determine the significant associations between biosecurity measures and pathogen risk category. Photos

were collected from farm visits to show case examples of good and bad biosecurity practice, to add to project documentation in work package 6.

The deliverable WP2.9 "Quantified biosecurity effectiveness from applied biosecurity protocol at farm" was submitted in December 2021.

JRP21-WP2-T3 Slaughterhouse biosecurity practices (M37-48)

An online survey was designed to collect information on best biosecurity practice in slaughterhouses. The survey took place in seven countries (DE, CZ, EE, IT, AT, UK and NL) with 32 responses. The survey included 20 questions organised into the sections general, transportation, lairage (waiting area at the slaughterhouse where arriving pigs are kept until slaughter), scalding, singeing, evisceration, carcase splitter, decontamination and chilling. The content was based on information about biosecurity measures' effectiveness presented in peer-reviewed literature and on opinions from slaughterhouse experts within the partner institutes.

Sampling methods for visits to slaughterhouses were agreed within the team. Bacteriological samples were collected from three slaughterhouses, one in CZ and two in IT. The samples were collected along the slaughter line to help validate information on the effectiveness of biosecurity practices. The evidence from the studies are being collated into a report on the effectiveness of slaughterhouse biosecurity.

The deliverable WP2.8 "Quantified biosecurity effectiveness from applied biosecurity protocol at slaughterhouses" was submitted in December 2021.

JRP21-WP2-T4 Field studies (M25-M54)

This task has been largely affected by COVID-19 lockdowns in the participating counties. However, longitudinal studies are planned to start soon in the UK and in IT. In NL, the research focus for this task has been updated and will now focus on internal biosecurity and spread of HEV between pens. A pilot study on four farms has been completed, the results of which were analysed and informed the final study protocol (choice of farm and age groups to sample) for the longitudinal study. Unfortunately, recruitment in NL has been delayed due to farmers withdrawing participation or being found to be HEV negative.

WP3 Impact of disinfection on persistence of pathogens in biofilm

WP3 and its lab work is partly delayed due to COVID-19 pandemic and consequences.

JRP21-WP3-T1 Comparison of methods for testing the effect of disinfectants (M25-46)

Parameters to compare methods for testing disinfectants effectivity were described. Reference strains to be used by all participating laboratories have been defined. Comparison of biofilm methods between labs is ongoing. Methods to continue with in Task 2-ST2 have been defined.

The deliverable WP3.7 "Assessed methods for testing disinfectants on *Salmonella* in biofilm" was produced and submitted in August 2021.

JRP21-WP3-T2 Effect of disinfectants on biofilm-associated wild type Salmonella (M25-50)

This task is ongoing. Disinfectants and conditions and biofilm methods to be used have been defined. Wild type strains have been selected and sent to all participating laboratories.

JRP21-WP3-T2-ST1: Selection of wild type Salmonella isolates (M25-M36)

A panel of *Salmonella* isolated from UK pig farms have been screened for their biofilm abilities using two methodologies. From this panel, six biofilm-forming *Salmonella* isolates, from serovars Derby and Typhimurium, have been selected for the use in Task 2-ST2.

JRP21-WP3-T2-ST2 Assessing the effect of disinfectants (M37-M56)

Each lab will use the already locally established biofilm model for testing the effectiveness of disinfectants. Lab work has been started, initial testing is ongoing.

JRP21-WP3-T3- Study of HEV stability in relation to disinfection approaches (M25-M56)

HEV stability in microfilms will be studied using appropriate HEV infectivity assays which have been developed in JRP21-WP3-T3-ST1, and will be further implemented in year 2 (and 3) of the project.

JRP21-WP3-T3-ST1 Adaptation and implementation of HEV infectivity assay for testing biofilms (M25-M36)

The HEV infectivity assay was completed (deliverable 3.6). In this assay, primary hepatocytes are isolated from liver tissue of (HEV free) piglets using a collagenase treatment. The obtained primary hepatocytes are aliquoted and stored at -180°C until use. For the actual assay, the hepatocytes are seeded onto plates and inoculated with different samples potentially contaminated with HEV. A second method for testing of HEV infectivity, precision-cut liver slices (PCLS) has been developed also and will be used further for validation of the hepatocytes assay (see above). Adaptations of the bioassay will be made as appropriate, to make it suitable for testing biofilms.
The deliverable WP3.6 "HEV infectivity assay is available" (M36) is implemented further. It has been tested on field samples and will be further validated using other HEV bioassays.

The deliverable WP3.5 "Method for testing persistence of infectious HEV in surface microlayers" was completed in June 2021.

JRP21-WP3-T3-ST2 (M37- 48)

We investigated whether there was a correlation between the presence of HEV and *Salmonella* in faecal samples of pigs. No significant correlation had been seen, however more samples need to be tested to obtain reliable outcomes. Farm samples taken in biofilm areas need to be tested for the presence of infectious HEV. This part is still ongoing and can take place in the first months of 2022 depending on when we are allowed to sample the farms. The method how to sample the environment/biofilms has been developed and tested. Electrostatic Dust Collectors (EDC) are used to swab the environment/ biofilm. The virus has been eluated, which means adsorbed material was removed from the adsorbent, EDC, by means of a solvent, 5ml of cell culture medium in this case and tested for the presence of HEV with the

use of real time PCR. In case of a positive result the sample will be grown in the HEV infectivity assay.

The deliverable WP3.14 "Information on the persistence of infectious HEV in surface microlayer/biofilm" is depending on the results of deliverable WP3.20 due at the end of 2021.

JRP21-WP3-T3-ST3 (M49-M56)

The deliverable WP3.20 "HEV infectivity test adapted for testing of HEV in biofilms" was delivered in December 2021.

WP4 Modelling of the cost and effectiveness of biosecurity measures

The lead of WP4 changed. The former leader Beate Pinior left AGES/Vetmeduni Vienna and the BIOPIGEE project. The former deputy Robin Simons (APHA) overtook the lead and Mathieu Andraud (ANSES) is new deputy.

JRP21-WP4-T2- Stochastic simulations on the effectiveness of biosecurity measures (M33-M56)

JRP21-WP4-T2-ST1- Data collection for the transmission models

The data collection phase for the network model was completed, but there were issues with obtaining pig movement data for some of the proposed case study countries. Data were obtained and successfully integrated into the model from France. Data were obtained from the UK, but due to data privacy issues, some data (e.g. information to identify individual farms) could not be shared. Considerable effort was put in to developing methods to allow geographical data to be used instead, but unfortunately this did not leave enough funding to fully integrate the UK data into the model and validate the results. The method is developed to allow this in the future, but the resource is unlikely to be available within BIOPIGEE. It was not possible to obtain movement data from Italy and while a potential source for similar data from Germany was identified, it was not possible to obtain the data in time.

Data collection for the QMRA is underway and has identified a number of potential gaps, particularly in relation to inactivation rates and dose-response for HEV, which we will look to resolve over the next year of the project.

JRP21-WP4-T3- Merge of models into one QMRA (M33-M56)

JRP21-WP4-T3-ST1- Different transmission models will be matched to one QMRA zoonotic pathogen model

Draft results of the farm-to-slaughter network transmission model with the French data have been produced, including simulations of some on-farm biosecurity interventions. This work is currently in publication process.

Despite delays due to staff resourcing, COVID-19 and outbreak response work related to avian influenza, work is underway to adapt the previous *Salmonella* QMRA for HEV. This includes developing methodology for consumption of liver as a route of human HEV infection and a methodology to simulate the inactivation of HEV during cooking of liver. Data collection has identified a number of potential gaps, particularly in relation to cross-contamination rates at the

slaughterhouse, inactivation rates and dose-response for HEV, which we will look to resolve over the next year of the project.

Discussions have taken place to ensure successful integration of the network model with the QMRA at the slaughterhouse stage. A poster on this process has been presented at the 2021 OHEJP annual meeting.

JRP21-WP4-T4- Economic model of biosecurity measures across Europe

This task has not yet worked on until M46 as the initial task leader, Beate Pinior/Conrady, left the project. A new member, Clara Bester took over this task in M47. Initial work concentrates on analysing the cost-related data collected within WP2 Task2 during the farm visits in several countries. Furthermore, a concept for the cost-benefit analysis is being developed taking into account outcomes from a literature review conducted within the COHESIVE project.

WP5 Benchmark of biosecurity practice

This work package was led by Veit Zoche-Golob from M35 until M47. Task T5.1, T5.2 and T5.4 have been intensively worked on and a first publication is in preparation, further publications are planned. The WP5 lead is currently being vacant and the recruitment process is ongoing at BfR. Delays in this WP are possible depending on the duration of the replacement.

JRP21-WP5-T1- Data integration from WP2-4 in catalogue of biosecurity measures (M27-56)

The catalogue of biosecurity measures to reduce HEV and/or *Salmonella* prevalence was revised to consider all relevant data from the project, to ensure consistent data and safe updates. Procedures for inputs and updates as well as backups were defined. Data was updated by the first results from T5.2 and T5.4. All BIOPIGEE participants were invited to supplement the BIOPIGEE catalogue of biosecurity measures. The catalogue is getting updated continuously with identified biosecurity measures and estimates of their effectiveness. This task is ongoing.

JRP21-WP5-T2- Literature review/meta-analysis (M27-50)

Ongoing. A first round of a systematic literature review about the effectiveness of biosecurity measures specifically against *Salmonella* and HEV in pigs farms is finished with the help of 10 reviewers from 7 countries, who evaluated about 1650 articles found in literature databases and according to a harmonised scheme. Relevant data were extracted and estimates of the effectiveness of the identified biosecurity measures were summarised by meta-analyses. The risk of bias of the included articles was assessed. First effect estimates were offered to WP4 at the end of M38 and entered in the catalogue of biosecurity measures (T5.1). The systematic literature and meta-analyses was then updated and expanded, including biosecurity measures to reduce the occurrence of pathogenic *E. coli* in pig herds. In this round, a total of 11 reviewers overall participated from 7 different countries. Tutorials on literature screening, data extraction and risk of bias analysis were held to instruct participants. In this updating turn, a software-based machine learning tool, ASReview was applied alongside the manual screening by reviewers, with thanks to the collaboration from the University of Utrecht. In total for the manual screening, 5130 article titles were initially included and 1185 abstracts were screened in duplicate. For ASReview, 4068 articles were uploaded onto the software and 536 abstracts were screened. After further full text screening, 82 articles moved to data extraction and finally

risk of bias analysis, with a final sample of 54 papers deemed to have sufficient primary data to be extracted for the analysis. Data cleaning of the extracted estimates has not been finished yet and is ongoing by four partners throughout December and January. Work can be delayed due to a lack of staff at BfR and elsewhere to conduct the analysis of the extracted effect estimates.

JRP21-WP5-T3-Machine learning approaches (M53-58)

This task has not started yet and conduction is unclear as the task leader left the project and replacement is unclear. Partly, the additional use of ASReview replaced this task.

JRP21-WP5-T4- Expert panel to add estimations on effectiveness/ weights (M33-52)

The questionnaire about biosecurity measures in primary pig production, developed in T2.1 and applied on farms in T2.2, was adapted for an expert survey to assess the importance of biosecurity measures to reduce *Salmonella* and HEV occurrence in different pig production systems.

For this, questions were reworded to best practice statements, considering results from T5.2 literature review, and the initial expert panel from T2.1 (scientists) was expanded to additionally incorporate knowledge of other stakeholders like practitioners, advisors, etc.. We found marked differences between the veterinary and consulting systems within the pig sectors of the different partner states. These differences in the systems considerably influence the understanding of the roles within the pig sector of different professions. We finally identified and agreed on superior grouping of expertise and representatives from participating countries were recruited for the panel. Due to the COVID-19 pandemic, the interviews were carried out with an online questionnaire.

The experts were asked to: 1) rate their own expertise for the pathogens HEV and *Salmonella*, for the husbandry systems and for biosecurity; 2) select the setting(s) they wanted to answer questions for (settings: HEV*indoor keeping, HEV*outdoor keeping, *Salmonella**indoor keeping, *Salmonella**outdoor keeping); 3) rank the effectiveness of eight biosecurity measure categories, scoring them between 1-80 based on their importance for pathogen prevention/control, and 4) within each category, score each specific measure, based on its relevance to control within each setting, between 1 (least relevant) and 5 (most relevant). Responses from 46 experts (from PL, UK, DE, BG, AT, IT, SE, NL, BE, EE, NO) could be included in the analysis. The experts' answers to the questionnaire were analysed.

Preliminary results indicate that, no biosecurity category stood out, with all category contributing to some extent. The experts also demonstrated the high importance of the majority of the biosecurity measures within the categories, nonetheless activities related to animal movement/mixing as well as cleaning/disinfection practices were consistently ranked high for all settings. Additionally, gaps relating to outdoor farming and HEV in pigs were identified and should be targeted in future research.

A manuscript for this study is intended to be submitted to a scientific journal and is currently in the internal review process.

This task is ongoing.

JRP21-WP5-T5 Benchmark system for effectiveness of biosecurity (M51-58)

This task has not started yet.

WP6 Dissemination

JRP21-WP6-T1- Assembly and development of biosecurity information (M27-60)

JRP21-WP6-T1-ST1- Identification of appropriate websites or other online channels

So far, 21 web sites in 6 countries have been identified for dissemination and are listed in a shared document. The link is accessible for the consortium via the OHEJP BIOPIGEE website. This task is carried out on an ongoing basis and the list is amended and updated throughout the project.

JRP21- WP6-T1-ST2a Provision of information for farming schools and websites

Illustrations of examples for good biosecurity (pictures), which are planned to be used in this task, have been collected in WP2. Pictures from different partner countries' farms have been uploaded to an assembly at our website. Ideas about the content of this material have been exchanged with an advisory service in Germany as well as at the online workshop between the BIOPIGEE project group and the T5.4 expert panel. At the beginning of 2022, a meeting with a German farming education centre is planned to find out how the material should be set up to address farming pupils. This task is ongoing.

JRP21-WP6-T1-ST2b Provision of slaughterhouse protocol to slaughter industry/related associations

A slaughterhouse biosecurity protocol/questionnaire has been developed and sent to slaughterhouses in seven countries (DE, CZ, EE, IT, AT, UK and NL).
The deliverable WP6.15 "Biosecurity protocol on slaughterhouse provided" was completed in December 2021.

JRP21-WP6-T2- Development of a support tool to calculate cost effectiveness (M55-60)

This task has not started yet.

JRP21-WP6-T3- Organisation of a workshop-series (M25-58)

JRP21-WP6-T3-ST1 Identification of relevant stakeholders

Ongoing. For the second workshop, an expert panel, recruited for T5.4, was invited for a web-meeting to discuss BIOPIGEE results.

JRP21-WP6-T3-ST2 Identification of relevant conferences

Due to the COVID-19 pandemic, physical conferences have been cancelled. Relevant conferences for hosting the third workshop in conjunction with a conference, were listed in our publication list, options have been discussed in the WP leader meeting in June and September 2021. The ESPHM as been identified for hosting the Workshop. The organisation is ongoing and the task group is in discussion with the conference team to open the arrangement for not only in person but also a hybrid, or even full online version. This will be re-assessed with consideration of the pandemic situation at the beginning of 2022.

JRP21-WP6-T3-ST3 Organisation of Workshop 1 (M25-54)

Due to the Covid pandemic, the first workshop was cancelled. National information events are planned instead. In Germany, participation in information days of and with animal health services took place to inform and discuss results from BIOPIGEE (25th Nov 2021). Here, contacts and exchange with a German consultancy service for biosecurity practice in pig farming and with a German training centre for farming apprenticeship were initiated. This exchange may be beneficial with testing and giving feedback when designing the information material in T6.1.2a and the support tool in T6.2.

JRP21-WP6-T3-ST4 Organisation of Workshop 2 (M40-48)

An online workshop was held on 14th December 2021. Listed experts for JRP21-WP5-T4 were invited to this half-day-workshop where preliminary results from the BIOPIGEE project were presented and discussed. There were in total 62 participants from 11 countries, 35 project members and 27 externals. The panel was represented by 17 participants.
The presentations gave a good overview about first findings. Main points in the discussions were how we define and delimit biosecurity measures in pig production and what has been so far learned about transmission of HEV between pigs. Moreover, a focus of this workshop was the exchange of ideas about how and where to disseminate outcome of the project to spread knowledge on best biosecurity practice in pig production.

JRP21-WP6-T5- Press release (M36-39)

Additionally, a press release about activities in the project has been drafted between partners (DE, UK, AT, SE) and published at the beginning of 2021.

JRP21-WP6-T6- Glossary of terms used in BIOPIGEE (M46-48)

A glossary of terms used in BIOPIGEE has been developed between tasks and is hosted in the infrastructure of the OHEJP MATRIX project. The BIOPIGEE Glossary can be accessed via a link on the OHEJP BIOPIGEE website since 17th December 2021.

3. Progress of the project: milestones and deliverables

Deliverables

JRP/JIP code	Project deliverable number *(Original number, if different from the actual one)*	Deliverable name *(Original name, if different from the actual one)*	Delivery date from AWP 2021 (month)	Date delivered on Project Group (month)	If deliverable not submitted on time: Forecast delivery date (month)	Comments *Please mention: public or confidential, the Zenodo reference, reason and justification of delay (for instance COVID), other comments*	Proposed category* *(1 to 8) (several categories may be applicable)*
21	D-JRP21-WP1.13	Project report 2nd year submitted	48	48, pending		Has been uploaded to the project web group and submitted as first version to OHEJP WP3. Based on the comments, it was revised and is planned to submit in M49	8 (reporting)
21	D-JRP21-WP1.19	Revised data management plan submitted	48	48 (49 last update in CDP)	Next 50/final 60	According to OHEJP DMP group end of the project; repeated updates in CDP/Project Group; next delivery is in M49/50	8 (reporting)
21	D-JRP21-WP1.2	First draft of data management plan finished	30	34 (website)		The DMP is uploaded to the project website, is entered and public in the CDP tool, gets repeatedly updated in a shared document and changes transferred to CDP; OHEJP DMP group recommends to upload only the final DMP to Zenodo.	8 (reporting)
21	D-JRP21-WP1.4	Project report 1st year submitted	36	36		Public, 10.5281/zenodo.4361090 https://zenodo.org/record/4361090	8 (reporting)
21	D-JRP21-WP2.1	Biosecurity protocol (addressing measures to control *Salmonella* and HEV) designed for data collection in the field	28	29 (44 zenodo)		Public as short version since 31.08.2021, 10.5281/zenodo.5336900 https://zenodo.org/record/5336900	2

JRP/JIP code	Project deliverable number *(Original number, if different from the actual one)*	Deliverable name *(Original name, if different from the actual one)*	Delivery date from AWP 2021 (month)	Date delivered on Project Group (month)	If deliverable not submitted on time: Forecast delivery date (month)	Comments *Please mention: public or confidential, the Zenodo reference, reason and justification of delay (for instance COVID), other comments*	Proposed category* *(1 to 8) (several categories may be applicable)*
21	D-JRP21-WP2.12	Produce report on evidence gathered by field studies	48		54	Delayed by six months due to problems with capability to conduct longitudinal trials during COVID-19 lockdowns and related issues with farmer recruitment.	
21	D-JRP21-WP2.8	Quantified biosecurity effectiveness from applied biosecurity protocol at slaughterhouses	42	48		Uploaded to the website, public as short version, 10.5281/zenodo.5774876 https://zenodo.org/record/5774876	4
21	D-JRP21-WP2.9	Quantified biosecurity effectiveness from applied biosecurity protocol at farm	42	48		Uploaded to the website, public as short version, 10.5281/zenodo.5792859 https://zenodo.org/record/5792859	4
21	D-JRP21-WP3.20	HEV infectivity test adapted for testing of HEVs in biofilm	48	48		Uploaded to the website, public as short version, 10.5281/zenodo.5793040 https://zenodo.org/record/5793040	1
21	D-JRP21-WP3.5	Method for testing persistence of infectious HEV in surface microlayers	36	42		Public, 10.5281/zenodo.4940091 https://zenodo.org/record/4940091; was delayed due to COVID-19 pandemic and consequences	2
21	D-JRP21-WP3.6	HEV infectivity assay available	36	36		Public as short version, 10.5281/zenodo.5242819 https://zenodo.org/record/5242819	2
21	D-JRP21-WP3.7	Assessed methods for testing disinfectants on *Salmonella* in biofilm	40	44		Public as short version, 10.5281/zenodo.5211242 https://zenodo.org/record/5211242	2

JRP/JIP code	Project deliverable number (Original number, if different from the actual one)	Deliverable name (Original name, if different from the actual one)	Delivery date from AWP 2021 (month)	Date delivered on Project Group (month)	If deliverable not submitted on time: Forecast delivery date (month)	Comments Please mention: public or confidential, the Zenodo reference, reason and justification of delay (for instance COVID), other comments	Proposed category* (1 to 8) (several categories may be applicable)
21	D-JRP21-WP4.11	Model Output: Number of animal cases with and without biosecurity measures	47		55	Delayed due to staff resourcing and COVI-19 issues.	
21	D-JRP21-WP6.10	Workshop 2 completed	42	48		Took place as virtual workshop on 14th Dec, between project group and expert panel, report: 10.5281/zenodo.5806257 https://zenodo.org/record/5806257	5
21	D-JRP21-WP6.15	Biosecurity protocol on slaughterhouse provided	48	48		Uploaded to the website, public as short version, 10.5281/zenodo.5772529 https://zenodo.org/record/5772529	2
21	D-JRP21-WP6.3	Workshop 1 completed	30		54	Cancelled due to pandemic situation. It may be replaced by local national workshops to disseminate results.	5

Categories of Integrative activities : 1. Design and implementation of surveillance and control activities; 2. Harmonised protocols and applied best practice; 3. Databases of reference materials and data, incl. metadata; 4. Standardised data formats, aligned data analysis for interpretation of surveillance data; 5. Sharing and communication of surveillance data; 6. Sharing of best intervention activities); 7. Prevention: aligned use of facilities and models; 8. Other (please specify);

Milestones

JRP Code	Milestone number	Milestone name	Delivery date from AWP 2020 (month)	Achieved (Yes/No)	If not achieved: Forecast achievement date (month)	Comments
21	M-JRP21-03	Relevant conferences for workshops to be held are identified	26	Yes (46)		Was delayed due to pandemic situation. It is planned to disseminate more findings in pre-conference-Workshop at the ESPHM on 11th March 2022
21	M-JRP21-05	Relevant stakeholders identified	28	Yes (36)		Was postponed due to the current COVID-19 situation (no workshops took place yet); Instead of stakeholders, a list of experts for a panel in T5.4 has been expanded (online table, link in BIOPIGEE private webgroup). These experts were finally invited for an online workshop to be hold in December 2021.
21	M-JRP21-06	Appropriate websites or other online channels for dissemination identified	30	Yes		List of web sites is being filled in an online table (link in BIOPIGEE private webgroup); Content will be continuously updated throughout the project
21	M-JRP21-07	Workshop 1 completed	30	Yes (47)		WP-leader decision: The workshop was cancelled due to COVID-19-outbreak, instead national information events in 2021/22 are planned (in Germany, animal health services were informed about our findings and discussed with at their conference in Nov 2021)
21	M-JRP21-09	First part of meta-analysis finished	36	Yes (38)		A literature review and meta-analysis was carried out. Was delayed due to partners involved in covid-testing and missing personnel for 4 months at BfR
21	M-JRP21-12	Mid-term meeting successfully organized	39	Yes		

JRP Code	Milestone number	Milestone name	Delivery date from AWP 2020 (month)	Achieved (Yes/No)	If not achieved: Forecast achievement date (month)	Comments
21	M-JRP21-13	Application of protocols across countries	40	Yes (46)		Was delayed and sample size slightly reduced in a few countries due to pandemic situation and restrictions for visiting farms.
21	M-JRP21-14	Relevant stakeholders re-identified	36	Yes (41)		As stated for M-JRP21-05, an expert panel is addressed instead. This was re-identified in M41.
21	M-JRP21-15	Transmission model adaptation based on available data	39	No (45)		Draft results for France complete, including some biosecurity interventions.
21	M-JRP21-16	Test methods to be used in JRP21-WP3-T2-ST2 are selected	40	No (46)		Milestone completed. Each lab will use the already locally established biofilm testing method for T2-ST2.
21	M-JRP21-17	Produce summary of evidence of slaughterhouse biosecurity effectiveness	42	Yes (48)		Development of questionnaire took longer than planned (review of peer-reviewed papers; consideration of technique in all countries; common understanding of relevant biosecurity measures and formulation of questions; translations; implementation into survey tool; test runs; data protection issues). The questionnaire was prepared and the survey was carried out in summer 2021.
21	M-JRP21-18	Workshop 2 completed	40	Yes (48)		Was postponed to the second half of 2021, due to pandemic situation, changed to a virtual workshop with the expert panel from T5.4.
21	M-JRP21-19	Completion of farm visits and lab work	44	No	54	Postponed, due to pandemic situation and restrictions on visiting farms in some countries.
21	M-JRP21-20	Application of appropriate economic methods based on available data	45		51	Postponed to beginning of 2022 as this task is depending on delayed tasks.

4. Publications and additional outputs

Publication title, DOI reference and Zenodo reference	Is OHEJP acknowledged?	Is it a Green Open Access? If yes please provide the embargo length and the manuscript release date	Is it a Gold Open Access? If yes please provide the processing charges (in €)
Propagation du virus de l'hépatite E de la case à la filière: analyse de réseaux complexes et modélisation, JRP conference/paper (accepted)	Yes	Yes	No
Complex network analysis to understand trading partnership in French swine production, PlosOne (revision in process)	Yes	No	Yes

Several publications, intended as peer-reviewed articles, are planned:

- in work: manuscripts in T1.1.1 on the definition of biosecurity measures (working title "What is a biosecurity measure? A definition proposal for farms and linked processing operations") and in T5.4 on the expert opinion about relevance of biosecurity measures (working title "Prioritization of pig farm biosecurity for control of *Salmonella* and hepatitis E virus infections, results of a survey among European experts"

- ideas/intended: manuscripts dealing with results (data evaluation is still in work) e.g. from T2.2/T2.3 on the application of biosecurity questionnaires in farms/slaughterhouses and effectiveness of measures to control *Salmonella* and HEV; from T2.4 on longitudinal studies about specific biosecurity measures in farms; from WP3 on test methods for disinfectants and biofilms/ for HEV stability; from T5.2 on literature review/meta-analysis about biosecurity measures in pig farming to reduce prevalence of HEV/Salmonella/pathogenic *E.coli.*

Additional output

Flyer

The Flyer describing briefly the BIOPIGEE project (D-JRP21-WP6.4) has been repeatedly used to e.g. inform participating farms in T2.2.

Posters/ Talks

- Catherine McCarthy, Robin Simons, Pachka Hammami, Mathieu Andraud, Stefan Widgren, Beate Conrady (2021). BIOPIGEE: Modelling of the cost and effectiveness of biosecurity measures. Poster at OHEJP ASM 2021. Copenhagen/Online. https://doi.org/10.5281/zenodo.4911566

- Claire Oastler, Mardjan Arvand, Katharina Konrat, Ane M. Osland, Vanessa Pfiffer, Lene Vestby, Becky Gosling (2021). Assessment of the biofilm forming capability of *Salmonella* isolates sourced from pig farms in Great Britain. Poster at OHEJP ASM 2021. Copenhagen/Online. https://doi.org/10.5281/zenodo.5497688

- Elke Burow (2021). Biosicherheitspraktiken für die Schweinehaltung in Europa / BIOPIGEE – Biosecurity practices for pig farming in Europe. Talk at the SGD conference 2021. Bad Sassendorf/online. https://doi.org/10.5281/zenodo.5797014

- Gergana Krumova-Valcheva, Albena Dimitrova, Eva Gyurova, Gergana Mateva, Mihail Milanov, Hristo Daskalov (2021). Hepatitis E in humans and pigs in Bulgaria (REVIEW). Poster at OHEJP ASM. Copenhagen/Online. https://doi.org/10.5281/zenodo.4926180

- Ivana Koláčková, Renáta Karpíšková, Tereza Gelbíčová, Zdenka Vacková, Jonaáš Vaňhara, Daniel Sperling (2021). *Salmonella* spp. in pig farms – still an issue?. Poster at ESPHM. Online.

- Nikolaus Huber, Elena L. Sassu, Gergana Krumova-Valcheva, Marina Meester, Ivana Kolackova, Petra Vasickova, Elisabeth Waller, Giuseppe Aprea, Annemarie Käsbohrer, Veit Zoche-Golob, Elke Burow (2021). Biosecurity measures reducing *Salmonella*ssp. andhepatitis E virus prevalence in pig farms: A systematic Review and Meta-analysis. Poster at OHEJP ASM 2021. Copenhagen/Online. https://doi.org/10.5281/zenodo.4905616

- Pachka Hammami, Nicolas Rose, Vladimir Grosbois, Stefan Widgren, Andrea Apolloni and Mathieu Andraud (2021). Live animal movements - Understand trade partners choices to predict chains of contact. Poster at SVEPM. Online. https://doi.org/10.5281/zenodo.5005733

- Pachka Hammami, Stefan Widgren, Vladimir Grosbois, Andrea Apolloni, Nicolas Rose, Mathieu Andraud (2021). Complex network analysis and Exponential Random Graph Models: Epidemiological implications of network structures. Talk at the Modah conference 2021. Online. https://doi.org/10.5281/zenodo.5512130

- Pachka Hammami, Stefan Widgren, Vladimir Grosbois, Andrea Apolloni, Nicolas Rose, Mathieu Andraud (2021). Multi-levels Hepatitis E Virus Spread In Various Epidemiological Contexts: Combining Complex Network Analysis & Disease Transmission Model. Talk at the CCS conference 2021. https://doi.org/10.5281/zenodo.5638730

- Renate W. Hakze - van der honing; Sophie van Oort; Wim H.M. van der Poel (2021). Development of an ex vivo infectivity assay for Hepatitis E Virus. Poster at OHEJP ASM2021 Copenhagen/Online. https://doi.org/10.5281/zenodo.4946490

- Richard P. Smith, M. J. Vilar, Hannah Jones, Elke Burow (2021). Preliminary description of biosecurity practices related to importing pig and semen onto European pig farms. Poster at OHEJP ASM 2021. Copenhagen. https://doi.org/10.5281/zenodo.4906860

- Tarmo Niine, Arvo Viltrop, Imbi Nurmoja, Richard Smith, Elke Burow (2021). *Salmonella* in slaughterhouse!? What would be the right questions in that situation?. Society for Veterinary Epidemiology and Preventive Medicine (SVEPM) annual conference 2021. Online. Zenodo.https://doi.org/10.5281/zenodo.5496890

- Tarmo Niine, Arvo Viltrop, Imbi Nurmoja, Richard Smith, Elke Burow (2021). Identification of the best biosecurity practices in slaughterhouse in regards to *Salmonella* and hepatitis E virus. The One Health EJP Annual Scientific Meeting. OHEJP ASM 2021. Copenhagen/Online. Zenodo.https://doi.org/10.5281/zenodo.5496902

Press release

A press release about the project has been developed for creating awareness. Partners have translated it to local languages. It has been used as a template to spread information in Sweden, Austria and Germany (https://www.sva.se/forskning/internationellt-samarbete/europeisk-samverkan-kring-livsmedelsburna-smittor/biopigee-ett-one-health-ejp-projekt/https://www.bfr.bund.de/cm/343/gefahr-im-schweinestall-ein-forschungsvorhaben-soll-die-ausbreitung-von-salmonellen-und-hepatitis-e-viren-begrenzen.pdf). German farming magazines like topagrar and Rind&Schwein published a project description as well.

Social media

The annual BIOPIGEE progress meeting was advertised on the OHEJP twitter feed.

Websites

- The BfR website and BfR Twitter account informed about the project to increase its awareness   - https://www.bfr.bund.de/en/biosecurity_practises_for_pig_farming_across_europe__ejp_biopigee_-252636.html

    https://twitter.com/bfrde/status/1356619760625201152?lang=bg

- The cross-sectional study within work package 2 task 2 was advertised on the British National Pig Association website - http://www.npa-uk.org.uk/Participants_wanted_for_biosecurity_study.html

Glossary

An online glossary of terms used in BIOPIGEE has been developed between task partners in collaboration with the MATRIX project. It is findable and accessible via the BIOPIGEE website, and directly https://knime.bfr.berlin/knime/webportal/space/EJP_ORION/BIOPIGEE/BiopigeeGlossary?exec=abaebb77-0905-40f1-918c-2bffef0d1ab9

Outcomes (deliverable, publication, folder, tool, etc.) of the project that might be suited for communication purposes to various audiences, for instance food safety or AMR scientists, national and international stakeholders, specific professionals, the general public, etc.

In the BIOPIGEE project, **biosecurity protocols** and **questionnaires**, tailored to identify measures against the specific and different pathogens *Salmonella* and **HEV on farm** (**indoor** and **outdoor** system) and at **slaughterhouse**, have been developed and harmonised among European countries. This is an important base for controlling occurrence of these zoonotic pathogens in the food chain. The listed measures will be available for use beyond the project period. The protocol development approach could serve as orientation for the adaptation of protocols to target other pathogens.

A common and deeper understanding of the meaning of biosecurity practice through the **definition of 'biosecurity measure'** was developed between the partners through a scope review and discussion sessions in the project group. The definition can facilitate future communication on best biosecurity practice.

The **approach** for a **literature review** on the **complex** topic of effective **biosecurity measures** against different pathogens in the pig production has been developed for the use with an **international group** of several reviewers. Competences among partners were expanded. The approach, incl. produced tutorials, could be used further after the project.

Within the framework of work package 3 (impact of disinfection on persistence of pathogens in biofilm), harmonisation of methods among the participating laboratories was achieved with regard to the definition of reference strains and the selection of **test methods** for the effect of disinfectants on *Salmonella* **and HEV in biofilms**, and is still being in progress. This is new and important basic knowledge for the control of HEV and *Salmonella* occurrence.

5. Contacts and cooperation with national or international projects, organizations (e.g. ECDC, EFSA, EMA, EEA, FAO, OIE, WHO), networks, or national ministries

A **collaboration** between BIOPIGEE and the **OHEJP MATRIX** was initiated. A number of relevant terms related to biosecurity practice in primary pig production were identified, defined and thereby common understanding developed within and between BIOPIGEE task groups and its partner institutes. It was agreed between Matrix and BIOPIGEE to implement an **online glossary** and to place its link on the OHEJP BIOPIGEE website. For this, the glossary was transferred and implemented in the infrastructure developed by MATRIX, which allows filtering and searching for terms and makes them easily accessible. The glossary is hosted on an BfR server. The OHEJP Communication Team supported this initiative by including a link towards the glossary at the BIOPIGEE website. Hereby, terms and definitions used in BIOPIGEE were made findable, accessible and reusable.

Dr Carla Gomes of **Animal Health Ireland** was engaged to see if there is potential for collaboration with a study that she is conducting on the effectiveness of biosecurity measures in Irish pig herds. There is the potential to add their data into the analyses of this project, although the Irish data will only be available towards the end of the project.

BIOPIGEE is in contact with the EU/global project **HealthyLivestock**. In a web-meeting between both projects on May 4th 2021, overlap between several parts in the projects was identified and we agreed that sharing insights is valuable. In particular, the key factors associated with disease prevention to be identified in HealthyLivestock and the key biosecurity measures associated with reduction of *Salmonella*/HEV prevalence to be identified in BIOPIGEE appear valuable to compare. It is intended to present this comparison in a joint paper. A next meeting between both projects is planned for spring 2022 when relevant tasks are further along in their process.

The **German Federal Ministry of Food and Agriculture** indicated interest in the T2.3 survey on biosecurity measures in the pig slaughter line. We forwarded a link to the German version of the questionnaire to the Ministry.

A **software-based machine learning tool, ASReview**, could be applied alongside and thereby supplement the extensive manual screening by reviewers in WP5 T5.2, with thanks to a collaboration from the **University of Utrecht (library,** Felix Wejdema).

Thanks to a collaboration with the **German Meat Industry Association** (Verband der Fleischwirtschaft e.V.) and its support of our study, the survey on biosecurity measures at slaughter was sent out to more than 90 German slaughterhouses via the association's newsletter.

The Food Standards Agency in the UK are collaborating in the study, assisting with recruiting slaughterhouses into the study of slaughterhouse biosecurity effectiveness and also participating in reviewing and informing on relevant guidance documents. The project clearly benefits from **national collaborations with animal health services/veterinary services and practicing veterinarians**, which partly have already existed before (in Germany, we could build on a proven cooperation with animal health services after the project ORRES) and partly are being built during the BIOPIGEE project, are of high importance and support for the project.

These services/vets can recruit farms based on their client pool and are less restricted in accessing farms for sample collection/survey in the covid-19 situation. They are also involved in our expert panel and will play an important role in the dissemination part as having a special interest in our findings and to disseminate them. In the expert panel, also staff with agricultural and teaching background (chambers of agriculture), scientists from different national (research) institutes (e.g. FLI in Germany) and universities (e.g. Vetmeduni Vienna/Leipzig, University of Rostock, Utrecht University), quality controllers of the pig production chain are included. Additionally, the cooperation with universities also makes it possible to obtain data and information from on-going national projects to fill any data gaps in our WPs. For instance, cooperation with Austrian swine clinics enables to recruit farms to participate in questionnaires and to obtain information about existing data sources. Thanks to these collaborations, we can build on a strong network of varied experts between practice and science in Europe.

To enable consideration of **pig movement information** for simulation studies in WP4, we intensified a contact to the **Chamber of Agriculture** in the **German federal state North Rhine-Westphalia** and initiated their collaboration with ANSES and AGES. The Chamber and institutes are exchanging information and ideas.

For a target group orientated preparation of dissemination material and tool (WP6), contacts were initiated between BfR and a **German public consultation service on biosecurity in pig farming** (Biosicherheitsberatung Schweinehaltung, Tiergesundheitsdienste der **Tierseuchenkasse Baden-Württemberg**). An additional contact was made with a **German training centre for farming apprenticeship** (Chamber of Agriculture North Rhine-Westphalia). Ideas are getting exchanged on how material and a tool can be designed to address the needs and interest of pig farmers. It was agreed to send draft material for feedback to the consultancy service and to keep them updated about new outcome from the project. A meeting with the training centre took place January 2022.

6. Follow-up of the recommendations and comments in previous review(s) by the Ethics Advisors

The Ethic Advisors already accepted your comments. Therefore, this part of the report has been closed.

7. List of critical risks

Description of risk	Yes/No
Loss of key-persons (staff and / or leaders)	Yes
Delay in work plan execution	Yes
Conflicts within the consortium	No
Lack of commitment of partners	No
Delay in duties, tasks or reporting	(Yes)
Poor intra-project relationship	No
Potential entry/exit of partners	No
Other risks (please describe)	Yes

Additional information

Due to the pandemic, the project is delayed. Therefore an extension was requested and work plans were modified (for several tasks and links between them) in 2021, to enable the fulfilment of the project as much as possible. Many parts of the work have already been done. Still, important studies need to be carried out and finalised in 2022. As several partners are still or again involved in covid-19 related tasks and as the dynamic pandemic situation can lead to a hardly plannable workload, this could lead to additional delays in the project because of conflicting tasks and change of contact partners when forwarding tasks to colleagues. However, the partners and the group have gained experience in this situation, trained handling of changes/ sharing of work even though there have only been virtual meetings for a long time. In addition to bilateral, WP-/Task-group and WP-leader meetings, a Midterm meeting (2nd/3rd March) and a Workshop (14th December) enabled intensive exchange about current topics, strengthening the team and finding solutions in dialogues together. We hope to be able to also physically meet for Workshop 3 and the final project meeting in 2022.

Uncertainties in the budget planning in OHEJP at this stage and the currently advised caution with expenses and extension of employment contracts of temporary staff (with contracts until previous end of the project) can lead to questions at the partner institutes and in the project about how this can be handled. There is a risk that there will be too few staff available for the entire planned work.

BfR:
The WP5 leader and project deputy Veit Zoche-Golob has left the project (mid of November 2021). The position is currently vacant at BfR. A competent and fast replacement is important for the fulfilment of the planned work, even though much could already be implemented or finalised. Staff is also needed to organize and support within tasks.

AGES/VetMedUni:
The WP4 leader left the project (spring 2021). A replacement has been found in November 2021 and is currently getting introduced to the task.

AGES:
Due to the epidemiological situation in Austria and the related lock-downs, farm visits could not take place in full number as planned (fulfilled 2/3). Concerning the lab work, HEV investigations were delayed. This was initially due to difficulties in trying to harmonize the protocol to the one used in the project (finding reagents and establishing protocols to ensure

standardization). Technical difficulties have been solved, but investigations were delayed as most of the staff has been busy with COVID diagnostics.

APHA:
We are finding that farmers are less willing to engage with research during the COVID pandemic, and this is slowing recruitment. However, this has improved during 2021.

WBVR:
Due to the Covid19 pandemic work on this project was delayed at least 6 months. We aim to catch up as soon as possible. However, it remains unsure what delays in the end will be.

8. List of dissemination and communication activities

Attended/organised activities were reported by filling in the online form:
https://surveys.sciensano.be/index.php/754325?lang=en

Dissemination attendees-Final versio

Name of the activity:			
Date:			
Place:			

Specify the Dissemination and Communication activities linked to the One Health EJP project for each of the following categories			
	Yes / No		Yes / No
Organisation of a Conference		Participation to a Conference	
Organisation of a Workshop		Participation to a Workshop	
Press release		Participation to an Event other than a Conference or a Workshop	
Non-scientific and non-peer-reviewed publication (popularised publication)		Video/Film	
Exhibition		Brokerage Event	
Flyer		Pitch Event	
Training		Trade Fair	
Social Media		Participation in activities organized jointly with other H2020 projects	
Website		Other	
Communication Campaign (e.g. Radio, TV)			

Specify the estimated number of persons reached, in the context of this dissemination and communication activity), in each of the following categories			
	Number		Number
Scientific Community (Higher Education, Research)		Media	
Industry		Investors	
Civil Society		Customers	
General Public		Other	
Policy Makers			