World Organisation for Animal Health

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WOAH Reference Laboratory Reports Activities 2024

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LABORATORY INFORMATION

***Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:**	Enzootic abortion ewes (ovine chlamydiosis)
***Address of laboratory:**	Institute of Veterinary Pathology, Vetsuisse Faculty, University of Zurich, Winterthurerstrasse 268, CH-8057 Zurich
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***E-mail address:**	nicole.borel@uzh.ch
Website:	https://www.vetpathology.uzh.ch/de.html
***Name (including Title) of Head of Laboratory (Responsible Official):**	Prof. Dr. med. vet. Nicole Borel, Dipl. ECVP, FVH Pathology
***Name (including Title and Position) of WOAH Reference Expert:**	Dr. med. vet., Dr. sc. nat. Hanna Marti
***Which of the following defines your laboratory? Check all that apply:**	Academic institution

TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAH Manual (Yes/No)	Total number of test performed last year	
Indirect diagnostic tests		Nationally	Internationally
ELISA (IDEXX Chlamydia)	Yes	5	0
ELISA (MVD Enfer Chlamydia	Yes	5	

abortus)			0

Direct diagnostic tests		Nationally	Internationally
Isolation of Chlamydia	Yes	46	0
Real-time PCR Chlamydiaceae	Yes	2074	0
Real-time PCR Chlamydia abortus	Yes	32	0
Real-time PCR Chlamydia suis	Yes	98	0
Real-time PCR Chlamydia pecorum	Yes	95	0
16S rRNA PCR & Sequencing	Yes	5	0
OmpA PCR & Typing	No	61	39
Immunohistochemistry for Chlamydia	Yes	5	1

TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAH?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOAH Members?

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOAH Member Countries	Country of recipients
plasmid DNA	qPCR standard	produced	0	0.015 ml	1	AUSTRIA,
Bacterial stock (SPG)	Cell Culture	produced	0	1.7 ml	3	AUSTRIA, THE NETHERLANDS, UNITED STATES OF AMERICA,
Sera	ELISA	provide	0	7.4 ml	1	ITALY,

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAH Members?

No

TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

No

7. Did your laboratory validate diagnostic methods according to WOAH Standards for the designated pathogen or disease?

No

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

No

9. Did your laboratory validate vaccines according to WOAH Standards for the designated pathogen or disease?

No

TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAH Members?

No

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAH Member?

Yes

Name of the WOAH Member Country receiving a technical consultancy	Purpose	How the advice was provided
GERMANY	Manuscript Preparation: Analysis of a ring trial study comparing different PCR tests (commercial, in-house) to identify Chlamydia abortus	Remote, via Email

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAH Members other than the own?

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	WOAH Member Countries involved other than your country
WOAH ring trial, PCR methods to detect Chlamydia abortus	1 year	Improvement of diagnostic methods, collaboration between WOAH reference laboratories	FLI Jena, ANSES Paris, Moredun Research Institute	FRANCE GERMANY UNITED KINGDOM
Chlamydia pecorum in ruminants and pigs	2 years	Research collaboration, method transfer	University of the Sunshine Coast, Queensland	AUSTRALIA
Chlamydial transformation in animal chlamydiae	3 years	Research Collaboration	University of California, Los Angeles; Maastricht University; Medical University Vienna	AUSTRIA THE NETHERLANDS UNITED STATES OF AMERICA

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOAH?

Yes

Research need : 1

Please type the Research need: Our laboratory often receives inquiries concerning the viability/durability of Chlamydia abortus in animal products (e.g. wool,milk, semen) and animal waste (feces contaminated with placenta/vaginal fluid). While

the literature states that Chlamydia abortus can survive cold temperatures for weeks or even months, there is no systematic study investigating the survival of Chlamydia abortus in the environment.

Relevance for WOAH Disease Control,

Relevance for the Code or Manual Manual,

Field Epidemiology and Surveillance,

Animal Category Terrestrial,

Disease:

Enzootic abortion of ewes (ovine chlamydiosis)

Kind of disease (Zoonosis, Transboundary diseases) Zoonosis,

Additional keywords if needed: One keyword per entry

Viability,Durability,Shedding

If any, please specify relevance for Codes or Manual, chapter and title

(e.g. Terrestrial Manual Chapter 2.3.5 - Minimum requirements for aseptic production in vaccine manufacture)

Answer: Chapter 3.8.5. Enzootic Abortion of Ewes (Ovine Chlamydiosis)

Notes:

Answer: This project is currently ongoing (2023-2026). Results will be published in a peer-reviewed journal.

Research need : 2

Please type the Research need: Data from Australia has shown that Chlamydia pecorum may cause infectious abortion in ruminants, particularly sheep. In an ongoing study, we are testing archived abortion samples from Swiss laboratories for the presence of Chlamydia pecorum to dermine Chlamydia pecorum as an additional cause of ruminant abortion.

Relevance for WOAH Disease Control,

Relevance for the Code or Manual Manual,

Field Epidemiology and Surveillance,

Animal Category Terrestrial,

Disease:

Enzootic abortion of ewes (ovine chlamydiosis)

Kind of disease (Zoonosis, Transboundary diseases) Zoonosis,

Additional keywords if needed: One keyword per entry

Chlamydia pecorum

If any, please specify relevance for Codes or Manual, chapter and title

(e.g. Terrestrial Manual Chapter 2.3.5 - Minimum requirements for aseptic production in vaccine manufacture)

Answer: Chapter 3.8.5. Enzootic Abortion of Ewes (Ovine Chlamydiosis)

Notes:

Answer: This project is currently ongoing (2023-2026). Results will be published in a peer-reviewed journal.

TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:
The IVPZ is investigating ovine and caprine abortion cases for Chlamydia abortus by PCR methods as part of the Swiss national surveillance regulation (Art. 129) for notifiable diseases.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:
The data is centrally recorded by the Federal Veterinary Office (FVO). The IVPZ notifies the cantonal authorities about positive cases. This data is then submitted to the Swiss FVO.

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

8

1. Marti H, Shima K, Boutin S, Rupp J, Clarke IN, Laroucau K, Borel N. Zoonotic and other veterinary chlamydiae - an update, the role of the plasmid and plasmid-mediated transformation. Pathog Dis. 2024. 82:ftae030. doi: 10.1093/femspd/ftae030. Review

2. Seth-Smith H, Bommana S, Dean D, Read TD, Marti H. Chlamydia suis undergoes interclade recombination promoting Tet-island exchange. 2024. BMC Genomics 25(1): 724. Doi: 10.1186/s12864-024-10606-6

3. Hagenbuch F, Loehrer S, Marti H, Kasimov V, Jelocnik M, Borel N. Investigation of Chlamydia pecorum in livestock from Switzerland reveals a high degree of diversity in bovine strains. 2024. Vet Microbiol. 292:110057. doi: 10.1016/j.vetmic.2024.110057

4. Borel N. Zoonotic chlamydial infections: what's new? Lancet Infect Dis. 2024 Oct 16:S1473-3099(24)00582-6. doi: 10.1016/S1473-3099(24)00582-6.

5. de Souza LL, Pavarini SP, Bandinelli MB, Borel N, Pupin RC, Ramos CAN, Lemos RAA, Gomes DC. Encephalomyelitis and serositis caused by Chlamydia pecorum in buffalo calves from Brazil. Vet Pathol. 2024 Oct 10:3009858241288116.

6. de Arriba M, Borel N, LeibundGut-Landmann S. Water-filtered infrared A irradiation exerts antifungal effects on the skin fungus Malassezia. J Photochem Photobiol B. 2024 Jun;255:112909.

7. Vorimore F, Aaziz R, Al Qaysi L, Wernery U, Borel N, Sachse K, Laroucau K. Detection of a novel genotype of Chlamydia buteonis in falcons from the Emirates. Vet Microbiol. 2024 Apr;291:110027. doi: 10.1016/j.vetmic.2024.110027

8. Rosato G, Makoni GM, Cobos A, Sibila M, Segalés J, Marti H, Prähauser B, Seehusen F. Retrospective Analyses of Porcine Circovirus Type 3 (PCV-3) in Switzerland. 2024. Viruses (MDPI). 16(9): 1431. doi: 10.3390/v16091431

b) International conferences:

10

1. Seth-Smith H, Bommana S, Dean D, Read TD, Marti H. Chlamydia suis undergoes interclade recombination promoting Tet-island exchange. Chlam Health Meeting 2024, Ascona, Switzerland, 2023 (presentation).
2. Rayo E, Onorini D, Leonard C, Marti H, Pesch T, Hampel B, Low N, Borel N. Chlamydia trachomatis/Neisseria gonorrhoeae co-infection in men-who-have-sex-with-men: preliminary findings from the Swiss PrEPared cohort study. Chlam Health Meeting 2024, 20. Deutscher Chlamydienworkshop, Ascona, Switzerland (presentation, presenting author: Enrique Rayo)
3. Fässler N, Jelocnik M, Szymanska-Czerwinska M, Borel N, Marti H. Establishing shuttle vector-based transformation systems for Chlamydia pecorum and Chlamydia abortus. Chlam Health Meeting 2024, Ascona, Switzerland (presentation, presenting author: Nadja Fässler)
4. Hagenbuch F, Loehrer S, Marti H, Kasimov V, Jelocnik M, Borel N. Bovine Chlamydia pecorum strains from Switzerland display a high genetic diversity. Chlam Health Meeting 2024, Ascona, Switzerland (presentation, presenting author: Nicole Borel)
5. Altuntas E, Borel N, Marti H. Evaluating the viability and infectivity of Chlamydia abortus at different temperatures. Chlam Health Meeting 2024, Ascona, Switzerland (poster/poster flash, presenting author: Efe Altuntas)
6. Zubler D, Marti H, Biggel M, Borel N. Pilot study to detect Chlamydia suis in pig manure using real-time PCR. Chlam Health Meeting 2024, Ascona, Switzerland (poster/poster flash, presenting author: Daphne Zubler)
7. De Arriba M, Fässler N, Borel N, Marti H. Investigating the co-infection dynamics between tetracycline-resistant and sensitive strains of Chlamydia suis and Chlamydia pecorum. Chlam Health Meeting 2024, Ascona, Switzerland (poster/poster flash, presenting author: Magdalena de Arriba)
8. Alsaaod M, Hermann S, Sinniger M, Marti H, Albini S. Forensic Veterinary Medicine – Illegal disposal of pigeon carcasses with multiple epizootics. Chlam Health Meeting 2024, Ascona, Switzerland (poster/poster flash, presenting author: Maher Alsaaod)
9. Borel N. CHLAM Health – zoonotic chlamydial infections: what's new? 16th Annual Amsterdam Chlamydia Meeting (AACM), Amsterdam, The Netherlands (invited presentation).
10. Loehrer S, Hagenbuch F, Marti H, Pesch T, Hässig M, Borel N. Chlamydia pecorum in einem Schweizer Rinderbetrieb. NRL Referenzlabortagung FLI Jena, Germany (presentation).

c) National conferences:

3

1. Fässler N, Jelocnik M, Szymanska-Czerwinska M, Borel N, Marti H. Establishing shuttle vector-based transformation systems for Chlamydia pecorum and Chlamydia abortus. 4th Swiss Young Microbiologists Symposium (SYMS) 2024. Zurich, Switzerland (presentation, presenting author: Nadja Fässler)
2. De Arriba M, Fässler N, Borel N, Marti H. Investigating the co-infection dynamics between tetracycline-resistant and sensitive strains of Chlamydia suis and Chlamydia pecorum. 4th Swiss Young Microbiologists Symposium (SYMS) 2024. Zurich, Switzerland (poster/poster flash, presenting author: Magdalena de Arriba)
3. Altuntas E, Borel N, Marti H. Evaluating the viability and infectivity of Chlamydia abortus at different temperatures. 4th Swiss Young Microbiologists Symposium (SYMS) 2024. Zurich, Switzerland (poster/poster flash, presenting author: Efe Altuntas)

d) Other (Provide website address or link to appropriate information):

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Letter to the Editor:
Albini S, Marti H, Borel N, Hinic V, Imkamp F, Preiswerk B. 2024. Chlamydien: Nomenklatur, Wirtsspezifität, Diagnostik. In Response to: "Bombaci S, Ramseier A, Franzen D, Jungblut L, Frauenfelder T. Der unterschätzte Pneumonie-Erreger. Swiss Med Forum. 2023;23(47):1460–2"

Protocols:

Faessler N, Shima K, Marti H. 2024. Calcium chloride-mediated transformation of different Chlamydia species. https://dx.doi.org/10.17504/protocols.io.kxygxy53wl8j/v1

Pre-print articles:
1. BIORXIV/2024/603181. Development of shuttle vector-based transformation systems for Chlamydia pecorum and Chlamydia caviae. Nadja Faessler , Michael Biggel , Martina Jelocnik , Nicole Borel , Hanna Marti (BioArchive)
2. BIORXIV/2024/598221. Nanopore- and AI-empowered metagenomic viability inference. Harika Urel , Sabrina Benassou , Tim Reska , Hanna Marti , Enrique Rayo , Edward J Martin , Michael Schloter , James M Ferguson, Stefan Kesselheim , Nicole Borel , Lara Urban (BioArchive)

Homepage:
https://www.vetpathology.uzh.ch/de/forschung/Chlamydia-related-diseases-in-animals-and-their-zoonotic-potential.html

LinkedIn:
https://www.linkedin.com/company/74165915
https://www.linkedin.com/company/74158282

Invited Talks:
1. ChlamHealth – Chlamydiae in a One Health setting. Manchot Lecture in Infection Biology. 3rd MOI IV-Symposium of the Molecule of Infection (MOI) Manchot Graduate School, Düsseldorf, Germany
2. Borel N, Marti H. Not just an STI: a story about the intricacies of obligate intracellular chlamydiae. MIM Forum 8, Microbiology and Immunology (MIM) Graduate School UZH/ETH, Zurich, Switzerland. November 11, 2024. (presentation)

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAH Members?

No

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
ISO 17025	PDF	Akkreditierung-Urkunde-2020-2025.pdf

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
Histology, Immunohistochemistry, PCR-based molecular methods & sequencing	SAS (Schweizerische Akkreditierungsstelle)

20. Does your laboratory maintain a “biorisk management system” for the pathogen and the disease concerned?

Yes

Biorisk management is performed to according to federal ordinance (Verordnung) 814.912 Ordinance on Handling Organisms in

Contained Systems („Verordnung über den Umgang mit Organismen in geschlossenen Systemen", Einschlussverordnung, EV). Adherence to these regulations is controlled and regularly assessed by the in-house biosafety officer (BSO) and is subject to checks on institutional, state (cantonal) and federal level.

TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOAH?

Yes

National/ International	Title of event	Co-organiser	Date	location	No. Participants
International	ChlamHealth Meeting 2024	Beate Henrichfreise, University Bonn, Germany; Georg Häcker, Universitätsklinikum Freiburg, Germany	2024-02-18	Ascona, Switzerland	66

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOAH?

No

TOR10: NETWORK WITH WOAH REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOAH Reference Laboratories designated for the same pathogen or disease?

Yes

24. Do you network (collaborate or share information) with other WOAH Reference Laboratories designated for the same pathogen?

Yes

NETWORK/DISEASE	ROLE OF YOUR LABORATORY (PARTICIPANT, ORGANISER, ETC)	NO. PARTICIPANTS	PARTICIPATING WOAH REF. LABS
Ovine Chlamydiosis	Organizer and Participant	2	ANSES Paris; FLI Jena

25. Did you organise or participate in inter-laboratory proficiency tests with WOAH Reference Laboratories designated for the same pathogen during the past 2 years?

Yes

Purpose of the proficiency test:	Role of your Reference Laboratory (organiser/ participant)	No. participating Laboratories	Participating WOAH Ref. Labs/ organising WOAH Ref Lab
Proficiency of Real-time PCR for Chlamydiaceae; Proficiency of Real-Time PCR for Chlamydia abortus	Participant	20	ANSES Paris (organiser)
Assessment of technical competence of laboratories in detection of Chlamydia abortus specific antibodies, testing of	Coordination Switzerland; Distribution to Swiss laboratories (main organizer: FLI Jena)	-	FLI Jena (organiser), ANSES Paris (participant)

positive sera			

26. Did your laboratory collaborate with other WOAH Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

Yes

Title of the project or contract	Scope	Name(s) of relevant WOAH Reference Laboratories
OIE Ring trial for improvement of molecular tests for Chlamydia abortus	Comparison of molecular tests for Chlamydia abortus	IVPZ Zurich, FLI Jena, ANSES Paris

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOAH Reference Laboratories for the same pathogen during the past 2 years?

No

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TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOAH?

No

29. Additional comments regarding your report:

No