

# List Products and Services

## IVD GmbH

Analytical Laboratory accredited by the German Accreditation Authority (DAkks)  
according to the European standard DIN EN ISO/IEC 17025

### Farm Animals: SWINE, RUMINANTS & POULTRY

Zoonoses in humans



IVD GmbH Innovative Veterinary Diagnostics  
Albert-Einstein-Str. 5  
30926 Seelze-Letter  
Germany



for *Leptospira* spp.



Deutsche  
Akkreditierungsstelle  
D-PL-18303-02-00



## Version of June 2026

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## General information

Samples are analysed individually. All prices listed are per sample and do not include statutory VAT. Please note that we do not accept payment via cheque.

Our General Terms and Conditions of Sale apply to all services; these can be viewed in our premises or on our homepage: <https://www.ivd-gmbh.de>.

Our privacy policy can be found at <https://www.ivd-gmbh.de/datenschutz>.

Please contact us in case of special diagnostic services, analyses or questions. We are prepared to answer any question and consider any request within the areas of our professional and technical expertise.

There is a surcharge for diagnostic services below a minimum charge of € 10.00.

A surcharge plus VAT will be assessed for retroactive modifications of orders authorised/requested/required by the customer.

## Selection and submission of samples

The materials best suited for serological examinations are serum or blood without anticoagulants.

The use of plasma (addition of EDTA, Li-heparin, citrate) can cause artefacts in the complement fixation test (CFT) and in agglutination reactions (HI, MAT, RBT and others).

Tissue and swab samples collected immediately *post mortem* from typical lesions are often more suitable for the molecular biological and cultural detection of agents than samples which can be taken *intra vitam*.

## Shipping recommendations

When pathogen levels are low, both analytical sensitivity and diagnostic certainty of molecular biological analyses are enhanced by immediate shipment of cooled samples, due to retardation of autolysis. Chill fresh tissues prior to shipment and include frozen gelpacks with the shipment; enclose paperwork in waterproof packaging. When shipping fresh tissues, consider the possibility of shipping delays due to weekends or holidays.

Information on regulations for the shipment of hazardous materials can be found on our home page: <https://www.ivd-gmbh.de>.

**The IVD GmbH laboratory is accredited according to European standard DIN EN ISO /IEC 17025. IVD has performed diagnostic testing for infectious agents of farm animals, horses, dogs, cats and exotic animals since 1997.**

Tests that do not conform to the regulations of the national accreditation body of Germany are marked with a superscript circle (°).

In test reports, only the method is reported, when using commercial test kits also the manufacturer is mentioned, not the batch number of the test kit or the version number of the manual (simplified report).

**Your personal contact****Direct dial**

<b>Central Office</b>	<b>+49 (0)511-220029</b>	<b>-0</b>
<b>Managing Partners</b>		
Katrin Strutzberg-Minder MSc, DSc		-0
Matthias Homuth DVM, Specialist in Veterinary Microbiology		-0
Jens-Peter Minder Industrial Manager		-0
<b>Quality Management</b>		
Astrid Ullerich DVM		-12
<b>Serology / Parasitology</b>		
Sebastian Fischer DVM, Specialist in Veterinary Microbiology		-22
<b>Molecular Biology</b>		
Jan Böhmer DVM		-30
<b>Bacteriology</b>		
Mira Schumann BSc		-40
<b>Pathology</b>		
Maren Biesler DVM		-13
<b>Administration</b>		
Centrale office		-0
Accounting		-84

## MATERIAL FOR SAMPLING, PACKAGING AND TRANSMITTAL OF SPECIMEN

The IVD GmbH provides its customers with material for taking samples of meat juice, oral fluid as well as sample containers for histological examination in smaller packaging units. The packaging corresponds to ADR regulation P650 for mail delivery to our laboratory.

	Minimum purchase/ packaging unit (PU)	Price in € per PU
<b>Suesse Post Box</b> (suitable for 12-16 blood samples or 5 fecal samples) incl. 1 protective bag with absorbent insert	20 pc.	27.30
<b>Suesse Post Box Maxi</b> (suitable for 24-32 blood samples or 10 fecal samples) incl. 2 protective bags with absorbent insert	15 pc.	30.20
<b>Protective Bag with absorbent insert</b> (for 6-8 blood or 5 fecal samples)	50 pc.	23.40
<b>Protective Bag LARGE with absorbent insert</b> (for 3 fecal poaches)	25 pc.	17.20
<b>Protective Container with absorbent insert and screw cap</b> (only for single samples)	50 pc.	16.90
<b>Fecal Tube with screw cap</b> 76x20 mm	100 pc.	18.70
<b>Formalin filled sample tubes</b> for histological examinations (100 ml urine cup with screw cap filled with 50 ml 4% Formalin)	40 pc.	18.70
<b>Meat Juice Collector with Stopper</b>	70 pc.	16.90
<b>FTA Cards</b> (4 spots each)	1 pc.	6.80
<b>DBS</b> (Dried Blood Spots - 5 spots each)	5 pc.	10.60
<b>Cold Pack</b> (according to availability)	max. 1 pc. per box	free of charge
<b>Mycoplasma Medium</b>	on request	
<b>Fecal Sampling Horse &amp; Small Animal Kit</b> each shipping box (Suesse Post Box) contains		
<ul style="list-style-type: none"> <li>• 1 sample collection guide for pet owners</li> <li>• 3 compostable feces bag</li> <li>• 1 protective bag large</li> </ul>	10 pc.	20.00
<b>IVD Swine Oral Fluid Kit</b> each kit contains		
<ul style="list-style-type: none"> <li>• 1 user manual</li> <li>• 1 chewing rope made of cotton appr. 70 cm Ø 16 mm with fastening rope appr. 150 cm Ø 3 mm</li> <li>• 1 pair of disposable gloves</li> <li>• 1 large plastic bag for oral fluid collection</li> <li>• 1 sample tube</li> <li>• 2 small plastic bags</li> <li>• 1 adhesive label</li> </ul>	1 pc.	10.10
	from 12 pc. each	9.50

## HUMANS

### SEROLOGICAL TESTS (Antibody Detection)

Material: serum or blood without anticoagulants

#### ***Erysipelothrix rhusiopathiae*** (Erysipelas) ELISA°

Material: serum or blood without anticoagulants

#### ***Leptospira*** MAT°

Selected antigens of representative strains of different pathogenic serovars and serogroups

Material: serum or blood without anticoagulants

Testing for individual strains or serovars is possible after consultation

## HUMANS

### PCR TESTS (Antigen detection)

#### ***Leptospira*** realtime PCR

incl. differentiation of pathogenic *Leptospira* (subclades P1 and P2)

Material: body fluids or tissue depending on clinical manifestation

All examinations can be carried out as a service for self-paying patients or private patients.

For the collection of gargle samples, we offer practical sets including suitable packaging and shipping material.

Find more information on our website at <https://www.ivd-gmbh.de/home/>

## Test methods offered for various pathogen detections in pigs

Test methods / alphabetical list of pathogens	Indirect Pathogen Detection (Antibodies)						Direct Pathogen Detection							
	ELISA	Serotyp. ELISA	CFT	HI	MAT	RBT	PCR	qPCR	Differentiation	Typing	Sequencing	Bact. Culture	Parasitology	IHC
<i>Actinobacillus pleuropneumoniae</i>	•	•					•			•		•		•
ADV (Aujeszky's Disease Virus)	•													
ASFV (African Swine Fever Virus)	•													
<i>Bordetella bronchiseptica</i>												•		
<i>Brachyspira species</i>							•		•			•		
<i>Brachyspira hyodysenteriae</i>							•					•		
<i>Brucella, Brucella abortus</i>			•			•								
<i>Campylobacter spec.</i>							•							
Chlamydia							•							
Classical Swine Fever Virus (CSFV)	•													
<i>Clostridium perfringens</i>							•		•			•		
<i>Clostridiodes difficile</i>							•		•			•		
Coronavirus (PEDV, TGEV)							•		•					
<i>Cryptosporidia</i>													•	
<i>Cystoisospora suis</i>							•						•	
Dermatophyten (Hautpilze)												•		
<i>Enterococcus hirae, durans or villorum</i>									•*			•		
<i>Escherichia coli</i>							•		•			•		
<i>Eperythrozoon (Mycoplasma) suis</i>							•							
<i>Erysipelothrix rhusiopathiae</i> (Erysipelas)	•											•		
<i>Fusobacterium necrophorum</i>												•		

Test methods / alphabetical list of pathogens	Indirect Pathogen Detection (Antibodies)						Direct Pathogen Detection							
	ELISA	Serotyp. ELISA	CFT	HI	MAT	RBT	PCR	qPCR	Differentiation	Typing	Sequencing	Bact. Culture	Parasitology	IHC
<i>Glaesserella parasuis</i>	•						•			•*		•		
Influenza A Virus (swIAV)	•			•			•			•	•			•
<i>Lawsonia intracellularis</i> (PIA)	•						•	•						•
Leptospira (pathogenic Serovars)					•		•		•					(•)
<i>Mesomycoplasma flocculare</i>							•*					•		
<i>Mesomycoplasma hyopneumoniae</i>	•						•					•		•
<i>Mesomycoplasma hyorhinis</i>	•						•					•		
<i>Metamycoplasma hyosynoviae</i>							•					•		
Parasite stages in feces, skin parasites (mites, lice)													•	
<i>Pasteurella multocida</i> toxin A							•			•*		•		
Porcine Circovirus 2	•						•	•			•			•
Porcine Circovirus 3							•							
PEDV (Porcines Epidemic Diarrhoea Virus)							•							
Porcine Parvovirus	•						•				•			
PRRSV	•						•		•		•			
Rotavirus Group A							•							•
Rotavirus Group C							•							
Salmonella	•						•			•*		•		
<i>Schaalia (Actinomyces) hyovaginalis</i>												•		
<i>Sarcoptes scabiei</i> var. <i>suis</i> (Scabies Swine)	•												•	
<i>Staphylococcus aureus</i> - MRSA										•*		•		
<i>Staphylococcus chromogenes</i>										•*		•		
<i>Staphylococcus hyicus</i> - Toxin detection										•*		•		
<i>Streptococcus suis</i>							•			•*		•		
SVDV (Swine Vesicular Disease Virus)	(•)													

Test methods / alphabetical list of pathogens	Indirect Pathogen Detection (Antibodies)						Direct Pathogen Detection							
	ELISA	Serotyp. ELISA	CFT	HI	MAT	RBT	PCR	qPCR	Differentiation	Typing	Sequencing	Bact. Culture	Parasitology	IHC
TGEV (Transmissible Gastroenteritis Virus)	(•)						•							
<i>Trueperella abortus</i>												•		
<i>Trueperella pyogenes</i>												•		

\* Examination only possible from isolates; (•) Examination on request

**Suitable test materials for direct pathogen detection using PCR, bacteriology, histology and immunohistochemistry in pigs and ruminants**

suitable material / alphabetical list of pathogens	Meninges / Liquor		Conjunctival swab	Blood / Milk <sup>1</sup>	Nasal swabs	BALF/ TBS	Bronchial swabs	Lung	Tonsils/ Lymphnode	Feces / (fecal swabs)	Small intestine	Caecum / Colon	Cervical swabs	Abortion (Fetus/Placenta)	Serosa swabs	Joint	others
	<i>Actinobacillus pleuropneumoniae</i>						•		•	•							
<i>Bordetella bronchiseptica</i>					•	•	•	•									
<i>Brachyspira species</i>										•		•					
<i>Brachyspira hyodysenteriae</i>										•		•					
<i>Campylobacter spec.</i>										•	•						
<i>Chlamydia</i>		•											•	•			
<i>Clostridioides difficile</i>										•	•	•					
<i>Clostridium perfringens</i>										•	•						
<i>Cystoisospora suis</i>										•							swabs
Cryptosporidia										•	•	•					
<i>Enterococcus durans</i>										•	•						
<i>Enterococcus hirae</i>										•	•						
<i>Enterococcus villorum</i>										•	•						
<i>Escherichia coli</i>										•	•	•					Sepsis: kidney, CNS
<i>Eperythrozoon (Mycoplasma) suis</i>				•													
<i>Erysipelothrix rhusiopathiae</i> (Erysipelas)																•	kidney
<i>Fusobacterium necrophorum</i>														•	•		abscess, claw swab
<i>Glaesserella parasuis</i>						•	•	•							•	•	
Influenza A Virus					•	•	•	•									
<i>Lawsonia intracellularis</i> (PIA)										•	•	•					
Leptospira (pathogenic Serovars)	•			•									•	•			kidney, liver, internal genital organs, body fluids, vitreous, aqueous humor, urine
<i>Mesomycoplasma hyopneumoniae</i>						•	•	•									

suitable material / alphabetical list of pathogens	Meninges / Liquor		Conjunctival swab	Blood / Milk <sup>1</sup>	Nasal swabs	BALF/ TBS	Bronchial swabs	Lung	Tonsills/ Lymphnode	Feces / (fecal swabs)	Small intestine	Caecum / Colon	Cervical swabs	Abortion (Fetus/Placenta)	Serosa swabs	Joint	others
	<i>Mesomycoplasma hyorhinis</i>					•	•	•								•	•
<i>Metamycoplasma hyosynoviae</i>																•	
<i>Mesomycoplasma flocculare</i>							•										
<i>Pasteurella multocida</i>				•	•	•	•	•									
Porcine Circovirus 2/3			•		•		•	•	•		•	•	•	•			
Porcine Coronavirus										•	•	•					
Porcine Parvovirus			•											•			
Porcine Epidemic Virus										•	•						
PRRSV			•	•	•	•	•	•						•			
Rotavirus Group A / C										•	•						
<i>Salmonella</i>										•	•	•					
<i>Schaalia (Actinomyces) hyovaginalis</i>													•	•			abscess
<i>Staphylococcus aureus</i> - MRSA	•		• <sup>1</sup>	•	•	•	•	•					•	•		•	abscess
<i>Staphylococcus chromogenes</i>																	abscess, skin
<i>Staphylococcus hyicus</i> - toxin determination													•	•			abscess, skin
<i>Streptococcus dysgalactiae</i>	•		• <sup>1</sup>	•	•	•	•	•					•	•		•	abscess
<i>Streptococcus suis</i>	•				•	•	•	•							•	•	
Transmissible Gastroenteritis Virus										•	•	•					
<i>Trueperella abortusuis</i>													•	•			
<i>Trueperella pyogenes</i>							•						•	•		•	abscess

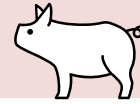
## Multiplex PCR and combinations of different examination methods

suitable material / pathogens	BALF/ TBS	Lung	Dry swab of Joints / Serosa	Feces
<b>Multiplex PCRs</b>				
„Neumünster“ ( <i>M. hyopneumoniae</i> , <i>M. hyorhinis</i> , swIAV, PCMV, PCV2, PRCV, PRRSV-1,-2)	•	•		
„App / GPS + vir“ ( <i>App</i> , <i>Gps</i> )	•	•		
„Serositis“ ( <i>Gps</i> , <i>M. hyorhinis</i> )			•	
„Arthritis“ ( <i>Gps</i> , <i>M. hyorhinis</i> , <i>M. hyosynoviae</i> , <i>Sc. suis</i> )			•	
<b>Combinations of different examination methods</b>				
„Outdoor Pigs - feces“ PCR + Parasitology ( <i>Brachyspira</i> differentiation by PCR, <i>Laws. intracellularis</i> PCR, <i>Salmonella</i> Choleraesuis/ Typhimurium PCR; flotation)				•
„Saugferkeldurchfall/ suckling piglet diarrhoea“ Bact. culture + PCR +Parasitology ( <i>E. coli</i> , <i>C. perfringens</i> , <i>Enterococcus</i> , Rota-/ Coronavirus; flotation)				•

## SWINE

### SEROLOGICAL TESTS (Antibody detection)

Material: serum or blood without anticoagulants



**ADV** (Aujeszky's disease virus or pseudorabies virus (PRV), Suid herpesvirus 1) ELISA

**App** (*Actinobacillus pleuropneumoniae*) ApxIV Toxin ELISA (standard)

**App** ApxII toxin ELISA (for research purpose only)

**App** LPS mix ELISA

#### **App serotyping / single App serotypes / groups**

- **App** ELISA virulent plus screening: virulent serotypes (ST 1/9/11; 5a/b) plus ST 2 (dominant in EU)
- **App** ELISA full screening (12 serotypes)
  
- **App** ELISA serotypes 1/9/11
- **App** ELISA serotype 2
- **App** ELISA serotypes 3/6/8
- **App** ELISA serotypes 4/7
- **App** ELISA serotypes 5a/b
- **App** ELISA serotype 10
- **App** ELISA serotype 12

**ASFV** (African swine fever virus) ELISA  
on request

**Brucella spec.** RBT

**CSFV** (Classical swine fever virus) ELISA

**Erysipelothrix rhusiopathiae** (Erysipelas) ELISA

**Glaesserella parasuis (Gps)** ELISA

**Influenza A Virus** ELISA (serum) (standard)

**Influenza A Virus** ELISA (oral fluid, saliva)

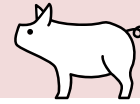
**Influenza A Virus** HI

(current strains of relevant subtypes in Germany; recommended for vaccinated sows)

## SWINE

### SEROLOGICAL TESTS (Antibody detection)

Material: serum or blood without anticoagulants



***Lawsonia intracellularis*** („PIA“) ELISA

***Leptospira*** MAT

(Selected antigens of representative strains of different pathogenic serovars and serogroups)

Testing for individual strains or serovars is possible after consultation

***Mesomycoplasma hyopneumoniae*** ELISA (standard)

***Mesomycoplasma hyopneumoniae*** ELISA (alternative)

***Mesomycoplasma hyorhinis*** ELISA

**PCV2** (Porcine circovirus 2) IgM / IgG ELISA (standard)

**PCV2** (Porcine circovirus 2) ELISA (alternative)

**PPV** (Porcine parvovirus) ELISA

**PRRSV** (Porcine reproductive and respiratory syndrome virus) ELISA (serum)

***Salmonella*** ELISA

Export of results into the Qualiproof® database

(as part of the salmonella monitoring and reduction program for pig production by QS Qualität und Sicherheit GmbH, Bonn, these charges are collected and passed on to Qualitype AG, Dresden, Germany)

***Sarcoptes scabiei var. suis*** (Scabies) ELISA

**SVDV** (Swine vesicular disease virus) ELISA

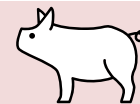
on request

**TGEV** (Transmissible gastroenteritis virus) /

**PRCV** (Porcine respiratory coronavirus) ELISA

on request

**SWINE**  
**EXAMINATION FOR INTERNATIONAL TRADE**

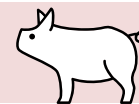


Price on request

Individually combined according to your specifications, e.g.:

African swine fever (ASFV)  
Classical swine fever (CSFV, Hog Cholera)  
Aujeszky's disease (ADV or PRV or SHV1)  
Transmissible gastroenteritis (TGEV)  
Swine vesicular disease (SVDV)  
Brucellosis  
PRRSV  
and many more.

**SWINE**  
**SEROLOGICAL SCREENINGS**  
Material: Serum or blood without anticoagulants



**RESPIRATORY PATHOGENS**

**Respiratory tract screening "Ahlem"**

*Actinobacillus pleuropneumoniae*  
*Mesomycoplasma hyopneumoniae*  
PRRSV  
Influenza A Virus (ELISA) or  
(HI)

**Respiratory tract screening "Glässer"**

*Actinobacillus pleuropneumoniae*  
*Glaesserella parasuis*  
PRRSV  
Influenza A Virus (ELISA) or  
(HI)

**REPRODUCTIVE PATHOGENS**

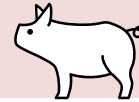
**Reproductive tract screening "Ery + Parvo"**

*Erysipelothrix rhusiopathiae* (Erysipelas)  
*Leptospira* (pathogenic serovars)  
PPV  
PRRSV

## SWINE

### SEROLOGICAL SCREENINGS

Material: Serum or blood without anticoagulants



#### Reproductive tract screening “Melle”

PCV2 IgM / IgG

PRRSV

*Leptospira*

Influenza A Virus (ELISA) or  
(HI)

#### Screening „Sow Vaccination“

PCV2 (IgM/ IgG)

PRRSV

PPV

Influenza A Virus HI

#### Health Check “Swine”

*Actinobacillus pleuropneumoniae*

*Erysipelothrix rhusiopathiae* (Erysipelas)

*Leptospira* (pathogenic serovars)

*Mesomycoplasma hyopneumoniae*

PPV

PRRSV

Influenza A Virus (ELISA) or  
(HI)

#### Screening „Outdoor Pigs“ - blood

*Erysipelothrix rhusiopathiae* (Erysipelas)

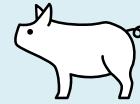
*Leptospira* (pathogenic serovars)

PRRSV

Influenza A Virus (ELISA)

## SWINE PCR TESTS

directly from sample material



### **App** (*Actinobacillus pleuropneumoniae*) apxIV PCR

Material: BALF, TBS, lung, tonsil

### **App** capsule typing by multiplex PCR (cps mPCR) molecular „serotyping“ of *App* isolates

Material: only fresh BALF, TBS, lung, tonsil or fresh samples on FTA-Cards

### **Brachyspira hyodysenteriae** realtime PCR

Material: feces, rectal swabs, large intestine

### **Brachyspira pilosicoli** PCR

Material: feces, rectal swabs, large intestine

### **Brachyspira spec.** PCR

Detection of *Brachyspira* species, *B. pilosicoli*, *B. hampsonii*, *B. intermedia*, *B. innocens*, *B. suanatina* and *B. murdochii*

Material: feces, rectal swabs, large intestine

### **Brachyspira** differentiation PCR

Detection of *Brachyspira* spec., *B. pilosicoli*, *B. hampsonii*, *B. intermedia*, *B. innocens*, *B. suanatina* and *B. murdochii* by PCR incl. *Brachyspira hyodysenteriae* by realtime PCR

Material: feces, rectal swabs, large intestine

### **Campylobacter** differentiation PCR

Detection of *Campylobacter* spec., *C. coli* and *C. jejuni*

Material: feces, rectal swabs, small intestine

### **Chlamydia** PCR

Material: Genital swabs, conjunctival swabs, placenta, fetal liver, lung, spleen, genital organs

### **Clostridioides (Clostridium) difficile** multiplex PCR

Detection of genes coding for toxin B and the binary toxin B

Material: feces, rectal swabs

### **Clostridium perfringens** multiplex PCR

Detection of types A and C

Material: feces, rectal swabs

### **Cystoisospora suis** PCR°

Material: feces, rectal swabs, environmental samples

### **Escherichia coli** „Virulence-Associated Factors“ multiplex PCR

Detection of virulence associated factor genes (fimbriae, adhesins, toxins and other factors)

Material: feces, rectal swabs

### **Escherichia coli** „EDEC“ multiplex PCR

Detection of EDEC- associated genes (shigatoxine 2e, F18-fimbriae),  
Identification of the pathotype of edema disease

Material: feces, rectal swabs

## SWINE PCR TESTS

directly from sample material



***Glaesserella parasuis (gps)*** multiplex PCR  
Detection incl. potential marker genes of virulence  
Material: BALF, TBS, lung

**Influenza A virus (swIAV)** realtime PCR  
Material: Nasal swabs (BALF, TBS, oral fluid/saliva), lung

**Influenza A virus (swIAV)** realtime multiplex PCR for subtyping of  
European swine influenza A virus  
Material: Nasal swabs (BALF, TBS, oral fluid/saliva), lung

**Influenza A virus (swIAV)** Sequencing° (by external lab) of a PCR product  
(HA gene of influenza A virus) incl. comparison and alignment to a reference  
strain  
only PCR (if sequencing cannot be carried out)

***Lawsonia intracellularis*** realtime PCR  
Material: feces, rectal swabs, small intestine

***Lawsonia intracellularis*** quantitative PCR (only individual samples)  
Material: feces, rectal swabs, small intestine

***Leptospira*** realtime PCR  
Detection including the differentiation of pathogenic *Leptospira*  
(subclades P1 and P2)  
Material: Genital swabs, urine, sperm, kidney, fetal tissues (kidney, liver, lung),  
placenta, genital organs (for *L. Bratislava*)

***Mesomycoplasma (Mycoplasma) hyopneumoniae*** realtime PCR  
Material: BALF, TBS, nasal swabs, bronchus swabs, lung

***Mesomycoplasma (Mycoplasma) hyorhinis*** PCR  
Material: BALF, TBS, nasal swabs, lung, bronchus swab

***Metamycoplasma (Mycoplasma) hyosynoviae*** PCR  
Material: synovial fluid, joint capsule, joint swab

***Eperythrozoon (Mycoplasma) suis*** („eperythrozoonosis“) PCR  
Material: blood (up to 5 samples may be pooled), (spleen, lung)

***Pasteurella multocida* Toxin (PMT)** PCR  
Detection of *toxA*-gen  
Material: nasal swabs, (up to 5 samples may be pooled), bacterial isolates

**PCV2/3** (Porcine circovirus 2 and 3) realtime PCR  
Material: BALF, TBS, blood, oral fluid/ saliva, tonsil, lymph node  
(up to 5 samples may be pooled)

**PCV2** quantitative PCR (**only individual samples!**)  
Material: BALF, TBS, blood, oral fluid/ saliva, tonsil, lymph node



**PCV2** Sequencing° (by external lab) of PCR product (orf2)  
incl. comparison of identity and alignment to the reference strain of the  
respective genotypes (type PCV2 a-h)  
only PCR (if sequencing cannot be carried out)

**PPV** (Porcine parvovirus) PCR

Material: abortion material, fetal lung

**PPV** Sequencing° (by external lab) of a PPV1 PCR product (VP2)

incl. comparison of identity and alignment to a reference strain

only PCR (if sequencing cannot be carried out)

**PRRSV** realtime multiplex PCR

differentiation of European and North American genotype or rather species  
PRRSV-1 and PRRSV-2

Material: BALF, TBS, blood, oral fluid/ saliva, sperm (intermittent excretion), lung,  
tonsil, placenta (up to 5 blood samples may be pooled)

**PRRSV** Sequencing° (by external lab) of PCR product

incl. comparison of identity and alignment to the reference strain of the  
respective species (type 1 (EU): strain Lelystad or type 2 (NA): VR 2332 =  
Ingelvac PRRS MLV (BI)) and vaccine strains registered in Germany

only PCR (if sequencing cannot be carried out)

Alignment to further strains / sequences (per strain/ sequence)

**Rotavirus group A and C** realtime PCR

Material: feces, rectal swabs, small intestine

**Salmonella Choleraesuis Typhimurium** PCR

detection of *Salmonella* and differentiation of serovars Choleraesuis and  
Typhimurium after cultural enrichment

Material: feces, rectal swabs, large intestine; isolates from bacterial culture

**Porcine corona virus PCR:**

**TGEV** (Transmissible gastroenteritis virus) & **PEDV** (Porcine epidemic  
diarrhoea virus) PCR

Material: feces, rectal swabs, small intestine

**Streptococcus suis (Sc. suis)** PCR

Material: synovial fluid, joint swab, joint capsule, meningeal swab, serosa

**Combinations of different examination methods****Screening „Outdoor Pigs“ - feces**

Material: only with feces samples, no swabs

*Brachyspira* differentiation PCR

*Lawsonia intracellularis* realtime PCR

*Salmonella* Choleraesuis Typhimurium PCR

Detection of parasites (flotation)

**Diagnostic profil „Suckling piglet diarrhoea“**

Material: only with feces samples, no swabs

Rota-/Coronavirus PCR

Bacterial culture for *E. coli*, *Enterococcus* and *C. perfringens*

Detection of parasites (flotation)

with add. bacterial culture for *C. difficile*

**Optional, if positive:**

Typing *E. coli* (multiplex PCR for detection of 21 virulence associated factors)

Typing *C. perfringens* (multiplex PCR & Immunoblot)

Differentiation of *Enterococcus* (PCR) (*E. durans*, *hirae*, *villorum*)

Resistance testing (Agar diffusion )

Resistance testing (Microdilution)

Resistance testing (Microdilution anaerobes)



## RESPIRATORY DISEASES

### **PCR Screening „Respiration“** (Material: BALF, lung)

*Actinobacillus pleuropneumoniae*

*Mesomycoplasma hyopneumoniae*

Influenza A Virus

PRRSV (realtime PCR with differentiation PRRSV 1 (EU) and 2 (NA))

### **PCR Screening „Respiration plus “** (Material: BALF, lung)

*Actinobacillus pleuropneumoniae*

*Mesomycoplasma hyopneumoniae*

Influenza A Virus

PRRSV (realtime PCR with differentiation PRRSV 1 (EU) and 2 (NA))

PCV2/3

### **PCR Screening „Respiration viral “** (Material: BALF, lung)

PRRSV (realtime PCR with differentiation PRRSV 1 (EU) and 2 (NA))

Influenza A Virus

PCV2/3

### **PCR Screening „Bakum“** (Material: BALF, lung)

*Mesomycoplasma hyopneumoniae*

Influenza A Virus

PCV2/3

PRRSV (realtime PCR with differentiation PRRSV 1 (EU) and 2 (NA))

### **PCR Screening „Dessau“** (Material: BALF, lung)

*Actinobacillus pleuropneumoniae*

*Mesomycoplasma hyopneumoniae*

PRRSV (realtime PCR with differentiation PRRSV 1 (EU) and 2 (NA))

PCV2/3

## REPRODUCTIVE DISEASES

### **PCR Screening „Reproduction“**

(Material: Pool of fetal lung, thymus, heart, kidney, placenta/ liver, genital swab)

*Chlamydia*

*Leptospira* (pathogenic)

PCV2/3

PPV

PRRSV (realtime PCR with differentiation PRRSV 1 (EU) and 2 (NA))



## **DIARRHOEA**

### **PCR Screening „Dysentery / Ileitis“**

(Material: feces, small and large intestine)

*Brachyspira hyodysenteriae*

*Lawsonia intracellularis*

### **PCR Screening „Enteritis“** (Material: feces, small and large intestine)

*Brachyspira hyodysenteriae*

*Lawsonia intracellularis*

*Salmonella* serovars Choleraesuis and Typhimurium

### **PCR Screening „Rota- / Coronavirus“** (Material: feces, small intestine)

Rotavirus group A and C

TGEV (Transmissible Gastroenteritis Virus)/ PEDV (Porcine Epidemic Diarrhoea Virus)

### **PCR Screening\* „Suckling piglet diarrhoea“** (Material: feces, small intestine)

*E.coli* incl.typing “virulence associated factors“

*Clostridium perfringens* incl. detection of types A and C

*Cystoisospora suis*<sup>o</sup>

Rotavirus A/C

### **PCR Screening\* „Suckling piglet diarrhoea plus“** (Material: feces, small intestine)

*E.coli* incl.typing “virulence associated factors“

*Clostridium perfringens* incl. detection of types A and C

*Cystoisospora suis*<sup>o</sup>

Rotavirus A/C and TGEV/PEDV

### **PCR Screening\* „Finisher“** (Material: feces, small and large intestine)

*E.coli* incl.typing “virulence associated factors“

*Brachyspira hyodysenteriae*

*Lawsonia intracellularis*

*Salmonella* serovars Choleraesuis and Typhimurium

### **PCR Screening\* „Finisher plus“** (Material: feces, small and large intestine)

*E.coli* incl.typing “virulence associated factors“

*Brachyspira hyodysenteriae*

*Lawsonia intracellularis*

*Salmonella* serovars Choleraesuis and Typhimurium

Rotavirus A/C and TGEV/PEDV

#### **\*Please note:**

**In the PCR screenings “Suckling piglet diarrhoea” and “Finisher” there is no pathogen cultivation, a resistance test and the preservation of isolates are not possible without further cultural examination!**



**PCR Screening „Oral Fluids“ for Herd Check**

(Material: oral fluid)

*Mesomycoplasma (Mycoplasma) hyopneumoniae*

*Mesomycoplasma (Mycoplasma) hyorhinis*

Influenza A Virus

PCMV

PCV2

PRCV

PRRSV 1 and 2 (EU/NA)

PPV

PEDV

Rotavirus A/C

*Brachyspira hyodysenteriae*

*Lawsonia intracellularis*

**MULTIPLEX PCR - SWINE**

**Multiplex PCR „Neumünster“** (Material: BALF, TBS, lung)

*Mesomycoplasma hyopneumoniae* (incl. confirming PCR)

*Mesomycoplasma hyorhinis*

Influenza A Virus

PCMV

PCV2

PRCV

PRRSV 1 and 2 (EU/NA)

**Multiplex PCR „APP / GPS (HPS) + vir“** (Material: BALF, TBS, lung)

*Actinobacillus pleuropneumoniae*

*Glaesserella parasuis* + potential virulence factor

**Multiplex PCR „Serositis“** (Material: dry swabs from serosa)

*Glaesserella parasuis* + potential virulence factor

*Mesomycoplasma hyorhinis*

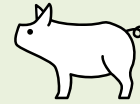
**Multiplex-PCR "Arthritis"** (Material: joint swabs, joint capsule)

*Glaesserella parasuis*

*Mesomycoplasma hyorhinis*

*Metamycoplasma hyosynoviae*

*Streptococcus suis*



**Examination by bacteriological culture, basic**

**Examination by bacteriological culture for respiratory pathogens**  
(incl. necessary selective culture media)

**Examination by bacteriological culture incl. anaerobes**  
using enrichment and selective culture media

**Examination by bacteriological culture for *Brachyspira***  
using selective culture media

**Examination by culture only for *Salmonella*** according  
DIN EN ISO 6579 1 using enrichment and selective culture media

**Examination by bacteriological culture incl. *Salmonella*** according  
DIN EN ISO 6579 1 using enrichment and selective culture media

**Examination by culture for *E. coli*, *C. perfringens* and *Salmonella***  
according DIN EN ISO 6579 1:2017 using enrichment and selective culture  
media

**Examination by bacteriological culture incl. *Mycoplasma***  
using enrichment and selective culture media  
Note: special transport medium is available on request

#### **Additional selective culture medium**

Please note that the identification of pathogenic bacteria species may incur further costs for diagnostic verification, e.g. for species identification by PCR or 16S rRNA typing (PCR and sequencing° (by external lab) including sequence analysis).

**microbiological disinfection control°**  
Total bacterial count and viable count *E. coli*, *C. perfringens* and mold fungi  
Note: pre-register one week in advance, please

**microbiological disinfection control°**  
only total bacterial count  
Note: pre-register one week in advance, please

Most suitable sample materials for cultural detection of bacterial pathogens of:

<b>Arthritis</b>	swab from joint capsule or joint cartilage, joint capsule, (synovia)
<b>Respiratory infections</b>	lung, lung and bronchial swab, bronchoalveolar lavage fluid (BALF)
<b>Dermatitis</b>	skin, deep skin scrapings
<b>Endometritis</b>	cervical swab
<b>Enteritis, Diarrhoea</b>	feces, fecal swab, rectal swab, small and large intestine
<b>Meningitis</b>	meningeal swab, CSF (liquor)
<b>Rhinitis</b>	nasal swab
<b>Sepsis</b>	kidney, spleen
<b>Serositis</b>	serosal swab

Note: **swabs with medium** are most suitable for cultural examination

## SWINE BACTERIOLOGY



### Identification of bacteria isolated at IVD as part of the cultural examination

Species identification by PCR of:

*Actinobacillus pleuropneumoniae*

*Bordetella bronchiseptica*

*Clostridioides difficile*

*Enterococcus durans*

*Enterococcus hirae*

*Erysipelothrix rhusiopathiae* (Erysipelas)

*Fusobacterium necrophorum*

*Glaesserella parasuis*

*Mesomycoplasma flocculare*

*Mesomycoplasma hyopneumoniae*

*Mesomycoplasma hyorhinis*

*Metamycoplasma hyosynoviae*

*Pasteurella multocida*

*Schaalia (Actinomyces) hyovaginalis*

*Staphylococcus chromogenes*

*Staphylococcus hyicus*

*Streptococcus dysgalactiae*

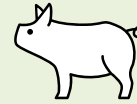
*Streptococcus suis*

*Trueperella abortusuis*

16S rRNA sequencing° (for identification of any bacterial species) (by external lab)

ITS sequencing° (for identification of further mycological species) (by external lab)

Cultural biochemical or serological differentiation



**Resistance / Susceptibility testing of bacterial isolates**

Agar diffusion test

Microdilution technique

(determination of the minimal inhibitory concentrations (MICs))

Microdilution technique anaerobes

**Custodial storage of bacterial isolates/ Mycoplasma**

**Delivery of characterised bacterial field isolates**

e.g. *Mycoplasma*, *Glaesserella parasuis* et al.

**Identification / differentiation of submitted bacterial isolates**

by PCR

***Actinobacillus pleuropneumoniae***

***Bordetella bronchiseptica***

***Clostridioides difficile***

***Erysipelothrix rhusiopathiae*** (Erysipelas)

***Fusobacterium necrophorum***

***Glaesserella parasuis***

***Mesomycoplasma flocculare***

***Mesomycoplasma hyopneumoniae***

***Mesomycoplasma hyorhinis***

***Metamycoplasma hyosynoviae***

***Pasteurella multocida***

***Schaalia (Actinomyces) hyovaginalis***

***Staphylococcus chromogenes***

***Streptococcus dysgalactiae***

***Streptococcus suis***

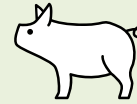
***Trueperella abortusuis***

**Additional subculture for submitted bacterial isolates**

for further analysis

16S rRNA sequencing° (for identification of any bacterial species) (by external lab)

ITS sequencing° (for identification of further mycological species) (by external lab)



**Typing of bacterial isolates/**

**Detection & typing of preserved nucleid acid from suitable samples**

***Actinobacillus pleuropneumoniae* PCR**

Typing by multiplex PCR Assay (virotype/ toxin typing) and (Serotype (cps)  
only ***Actinobacillus pleuropneumoniae* PCR**

Apx toxin typing (virotype)

only ***Actinobacillus pleuropneumoniae* multiplex PCR**

Determination of the serotype (cps)

***Clostridioides (Clostridium) difficile* PCR**

Detection of the genes coding for toxin A and B and the binary  
toxins A and B

***Clostridium perfringens***

Determination of types A to F with/without  $\beta$ 2 toxin gene/enterotoxin gene  
by PCR and detection of  $\alpha$  and  $\beta$ 2 toxin production by immunoblot

only: PCR

***Enterococcus (E.) hirae, E. durans, E. villorum* multiplex PCR**

Detection and differentiation of *E. hirae*, *E. durans* and/ or *E. villorum*

***E. coli* “Virulence-Associated Factors” multiplex PCR**

Detection of virulence-associated factor genes (fimbriae, adhesins,  
toxins, and other factors) incl. Edema Disease

***Glaesserella parasuis* / *Gps* Typing by PCR**

Serotyping by multiplex PCR Assay (serotypes 1-15) and  
Pathotyping (vtaA-LS-PCR)

only: Determination of the ***Gps* serotype** by multiplex PCR Assay  
(serotypes 1-15)

only: **Pathotyping** of ***Gps*** (prognosis of the possible virulence potential)  
by vtaA-LS-PCR

***Pasteurella multocida* toxin PCR**

Detection of the *tox*A gene

***Pasteurella multocida* capsule typing multiplex PCR**

Detection of capsular type A, B, D, E and F as well as haemorrhagic  
septicaemic (HS) capsular type B

***Salmonella* Serotyping** (according to the Kauffmann-White scheme)

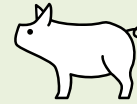
Classification into serogroups A-E and F-67 by agglutination

***Salmonella* Choleraesuis Typhimurium multiplex PCR**

Detection of *Salmonella* and differentiation of serovar Choleraesuis and  
Typhimurium

**Differentiation of *Salmonella* spp. vaccine and field strains**

Differentiation of the vaccine strains from Salmoporc



***Staphylococcus aureus***, methicillin resistant **s. MRSA**

***Staphylococcus hyicus*** multiplex PCR  
Detection of exfoliative toxin genes A-D and shetA

***Streptococcus suis*** multiplex PCR  
Determination of capsular type (12 cps) and four virulence-associated factor genes

**Detection of resistance markers in bacterial isolates**

**mcr-1 gene (colistin resistance) PCR**  
Detection of mcr-1 gene, which confers resistance to colistin

**MRSA Methicillin resistant *Staphylococcus aureus***  
Detection of mecA gene by PCR and of expression of penicillin-binding protein 2 (PBP2) by agglutination



**Detection of parasite stages in feces** Sedimentation Flotation  
Helminth eggs, protozoan oocysts and cysts  
Material: at least 10 g feces

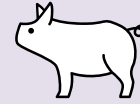
***Cryptosporidia*** Staining according to Heine  
Semi-quantitative direct detection of *Cryptosporidium* oocysts  
Material: 2-5 g feces (if possible, fresh and cooled, but not frozen!) or fecal smear

***Cystoisospora suis* PCR°**  
Material: feces, environmental samples

**Detection of skin parasites:**

**Mites** Microscopy, KOH procedure  
Sarcoptes (Scabies), Demodex (Demodicosis)  
Material: deep skin scrapings

**Lice (*Haematopinus suis*)**  
Microscopy  
Material: 3 transparent adhesive film strips per animal on microscope slides, combings and skin material



**NECROPSY of animals up to 59 kg bodyweight including disposal costs**

Animal carcasses are disposed of in accordance with the Animal Carcass Disposal Act according to the tariffs applicable in Lower Saxony, Germany.

Fetus and piglet (up to 5 kg) incl. placenta

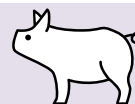
Young pig (5 - 15 kg)

Young pig (16 - 29 kg)

Pig (30 - 59 kg)

**Removal of specimen from aborted fetuses**

per sample



### **Histological examination (standard staining)**

with report

Special stainings (Ziehl-Neelsen, Gram, etc.)

### **IMMUNOHISTOLOGY**

#### ***Actinobacillus pleuropneumoniae* IHC**

Material: Lung, formalin fixed

#### **Influenza A Virus IHC**

Material: Lung (cranioventral parts mit bronchus), formalin fixed

#### ***Lawsonia intracellularis* IHC**

Material: Ileum, formalin fixed

#### ***Mesomycoplasma (Mycoplasma) hyopneumoniae* IHC**

Material: Lung (cranioventral parts mit bronchus), formalin fixed

#### **PCV2 IHC**

Material: Lymph node, lung, kidney, spleen, GI-tract, formalin fixed

#### **Rotavirus group A IHC**

Material: small intestine, formalin fixed

### **Information for sampling technique**

Tissue samples for histological and immunohistological examinations should be sent in at least **10 times the volume** of 4 or 10% fixed formalin and should not be thicker than **1 cm** in at least one dimension to ensure a sufficiently rapid penetration with the fixing solution.

A cover letter with a clinical preliminary report is essential for the interpretation of the histological findings and the limitation of the deducible etiological differential diagnoses.

Immunohistological examinations for the specific detection of certain pathogens in the tissue are only useful, if a previous histological examination revealed morphological changes, which justify the suspicion of infection with the pathogen in question. Is the meaning, which role a pathogen has played in a specific disease process, not of interest but just the question, whether or not an animal was infected with the pathogen, a PCR analysis of unfixed tissue is preferable due to its higher sensitivity.

## Test methods offered for various pathogen detections in ruminants

Test methods / alphabetical list of pathogens	Indirect Pathogen Detection (Antibodies)						Direct Pathogen Detection							
	ELISA	Serotyp. ELISA	CFT	HI	MAT	RBT	PCR	qPCR	Differentiation	Typing	Sequencing	Bact. Culture	Parasitology	IHC
Bovine Coronavirus							•							
<i>Brucella</i> , <i>Brucella abortus</i>			•			•								
<i>Campylobacter spec.</i>							•							
Chlamydia							•							
<i>Clostridium perfringens</i>									•*		•			
<i>Corynebacterium pseudotuberculosis</i>	•										•			
<i>Coxiella burnetii</i>	(•)													
<i>Cryptosporidia</i>												•		
<i>Dermatophytes</i>											•			
<i>Escherichia coli</i>									•*		•			
<i>Erysipelothrix rhusiopathiae</i> (Erysipelas)											•			
<i>Fusobacterium necrophorum</i>											•			
<i>Histophilus somni</i>							•				•			
Fasciola, Dicrocoelium (Ruminants)												•		
<i>Leptospira</i> (pathogenic Serovars)					•		•	•						
<i>Mannheimia haemolytica</i>							•				•			
<i>Mycobacterium avium ssp. paratuberculosis</i>	(•)						•							
<i>Mycoplasma bovis</i>	(•)						•				•			
<i>Mycoplasma bovirhinis</i>											•			
<i>Mesomycoplasma ovipneumoniae</i>											•			
<i>Neospora caninum</i>	•													
Parasite stages in feces, skin parasites (mites, lice)												•		

Test methods / alphabetical list of pathogens	Indirect Pathogen Detection (Antibodies)						Direct Pathogen Detection							
	ELISA	Serotyp. ELISA	CFT	HI	MAT	RBT	PCR	qPCR	Differentiation	Typing	Sequencing	Bact. Culture	Parasitology	IHC
<i>Pasteurella multocida</i>											•*	•		
Rotavirus Group A							•							•
Rotavirus Group C							•							
<i>Staphylococcus aureus</i> - MRSA										•*		•		
<i>Staphylococcus chromogenes</i>												•		
<i>Streptococcus dysgalactiae</i>												•		
<i>Streptococcus parauberis</i>												•		
<i>Streptococcus uberis</i>												•		
<i>Trueperella pyogenes</i>												•		

\* Examination only possible from isolates () examination on request



suitable material / alphabetical list of pathogens	Meninges / Liquor	Conjunctival swab	Blood / Milk <sup>1</sup>	Nasal swabs	BALF/ TBS	Bronchial swabs	Lung	Tonsils/ Lymphnode	Feces / (fecal swabs)	Small intestine	Caecum / Colon	Cervical swabs	Abortion (Fetus/Placenta)	Joint	Others
	<i>Streptococcus uberis</i>			● <sup>1</sup>									●		
<i>Trueperella pyogenes</i>			● <sup>1</sup>	●	●	●	●					●		●	Abscess

## Multiplex PCRs Ruminants / Combinations of different examination methods

### Cattle

suitable material / pathogen	Feces	Small intestine
	<b>“Diarrhoea of Calves”</b> Bact. culture + PCR + Parasitology ( <i>E. coli</i> , <i>C. perfringens</i> , Rota-/ Coronavirus; flotation, Cryptosporidia special staining)	●

suitable material / pathogen	Nasal swab	BALF/ TBS	Bronchial swabs	Lung
	<b>“Ruminant Respiratory Pathogens”</b> ( <i>M. bovis</i> , <i>H. somni</i> , <i>P. multocida</i> , <i>M. haemolytica</i> , bovine Coronavirus, BRSV, PI3)	●	●	●

**SHEEP AND GOAT**  
**SEROLOGICAL TESTS (Antibody detection)**  
Material: serum or blood without anticoagulants



***Brucella*** spec. RBT

***Corynebacterium pseudotuberculosis*** ELISA

***Coxiella burnetii*** (Q-Fever) ELISA

Material: blood serum, milk (individual and tank milk samples)  
on request

***Erysipelothrix rhusiopathiae*** (Erysipelas) SLA

***Leptospira*** MAT

(Selected antigens of representative strains of different pathogenic serovars  
and serogroups)

Testing for individual strains or serovars is possible after consultation

**SHEEP AND GOAT**  
**PCR TESTs (Antigen detection)**



***Leptospira*** realtime PCR

Detection including the differentiation of pathogenic *Leptospira*  
(subclades P1 and P2)

Material: Genital swabs, urine, sperm, kidney, fetal tissues (kidney, liver, lung),  
placenta, genital organs (for *L. Bratislava*)

***Mycobacterium avium* subsp. *paratuberculosis*** PCR

Material: feces, fecal swabs, milk, mesenterial lymph node, small intestine

**SHEEP AND GOAT**  
**HISTOLOGY UND IMMUNHISTOLOGY**



**Histological examination (standard staining)**

Special stainings (Ziehl-Neelsen, Gram, etc.)

**Necropsy of small ruminants is not possible due to animal health  
legislation regulations.**



**Examination by bacteriological culture, basic**

**Examination by bacteriological culture incl. anaerobes**  
using enrichment and selective culture media

**Examination by bacteriological culture only *Salmonella*** according  
DIN EN ISO 6579 1 using enrichment and selective culture media

**Examination by bacteriological culture incl. *Salmonella*** according  
DIN EN ISO 6579 1 using enrichment and selective culture media

**Examination by bacteriological culture: *E.coli*, *Cl. perfringens* and  
*Salmonella*** according DIN EN ISO 6579 1 using enrichment and selective  
culture media

**Examination by bacteriological culture incl. *Mycoplasma***  
using enrichment and selective culture media  
Note: special transport medium is available on request

#### **Additional selective culture medium**

Please note that the identification of pathogenic bacteria species may incur further costs for diagnostic verification, e.g. for species identification by PCR or 16S rRNA typing (PCR and sequencing° (by external lab) including sequence analysis).

Most suitable sample materials for cultural detection of bacterial pathogens of:

<b>Arthritis</b>	swab from joint capsule or joint cartilage, joint capsule, (synovia)
<b>Respiratory infections</b>	lung, lung and bronchial swab, bronchoalveolar lavage fluid (BALF)
<b>Dermatitis</b>	skin, deep skin scrapings
<b>Endometritis</b>	cervical swab
<b>Enteritis, Diarrhoea</b>	feces, fecal swab, rectal swab, small and large intestine
<b>Mastitis</b>	milk without preservatives or inhibitors
<b>Meningitis</b>	meningeal swab, CSF (liquor)
<b>Rhinitis</b>	nasal swab
<b>Sepsis</b>	kidney, spleen
<b>Serositis</b>	serosal swab

Note: **swabs with medium** are most suitable for cultural examination



**Identification of bacteria isolated at IVD as part of the cultural examination**

Identification of species by PCR:

*Clostridioides difficile*

*Fusobacterium necrophorum*

*Histophilus somni*

*Mannheimia haemolytica*

*Mycoplasma mycoides* (*Mycoplasma*) *bovirhinis*

*Mesomycoplasma* (*Mycoplasma*) *ovipneumoniae*

*Pasteurella multocida*

*Streptococcus parauberis*

*Streptococcus uberis*

16S rRNA sequencing° (for identification of any bacterial species)  
(by external lab)

ITS sequencing° (for identification of further mycological species)  
(by external lab)

Cultural biochemical or serological differentiation

**Resistance / Susceptibility testing of bacterial isolates**

Agar diffusion test

Microdilution technique

(determination of the minimal inhibitory concentrations (MICs))

Microdilution technique anaerobes

**Custodial storage of bacterial isolates / mycoplasma**

**Delivery of characterised bacterial field isolates**

e. g. *Corynebacterium pseudotuberculosis*, *Mycoplasma*, *Mannheimia*,  
*Pasteurella* and others

**Examination by mycological culture for dermatophytes**

using enrichment and selective culture media

Material: Hair with root, skin scrapings,  
please disinfect the sampling point beforehand

Note: pre-register one week in advance, please

**microbiological disinfection control°**

Total bacterial count and viable count *E. coli*, *C. perfringens* and mold fungi

Note: pre-register one week in advance, please

**microbiological disinfection control°**

only total bacterial count

Note: pre-register one week in advance, please



**Identification / differentiation of submitted bacterial isolates**  
by PCR

*Clostridioides difficile*  
*Fusobacterium necrophorum*  
*Histophilus somni*  
*Mannheimia haemolytica*  
*Mycoplasma* (*Mycoplasma*) *bovirhinis*  
*Mesomycoplasma* (*Mycoplasma*) *ovipneumoniae*  
*Pasteurella multocida*  
*Streptococcus parauberis*  
*Streptococcus uberis*

**Additional subculture for submitted bacterial isolates**  
for further analysis

16S rRNA sequencing° (for identification of any bacterial species)  
(by external lab)  
ITS sequencing° (for identification of further mycological species)  
(by external lab)

**Typing of bacterial isolates**

***Clostridium perfringens***

Determination of types A to F with/without  $\beta$ 2 toxin gene/enterotoxin gene  
by PCR and detection of  $\alpha$  and  $\beta$ 2 toxin production by immunoblot  
only by PCR

***Escherichia coli* “Virulence associated Factors” PCR**

Detection of virulence-associated factor genes (fimbriae, adhesins,  
toxins, and other factors)

**MRSA Methicillin resistant *Staphylococcus aureus***

Detection of *mecA* gene by PCR and of expression of penicillin-binding  
protein 2 (PBP2) by agglutination

***Pasteurella multocida* capsule typing PCR**

Detection of capsular type A, B, D, E and F as well as haemorrhagic  
septicaemic (HS) capsular type B

***Salmonella* Serotyping** (according to the Kauffmann-White scheme)

Classification into serogroups A-E and F-67 by agglutination

***Staphylococcus aureus*, methicillin resistant s. MRSA**



**Detection of parasite stages in feces** Sedimentation and flotation

Helminth eggs, protozoan oocysts and cysts

Material: at least 10 g feces

**Nematode larvae** Baermann-Wetzel migration technique  
of lung worms (*Dictyocaulus filaria*) and Protostrongylidae

Material: at least 10 g feces

***Cryptosporidia*** Staining according to Heine  
Semi-quantitative direct detection of *Cryptosporidium* oocysts  
Material: 2-5 g feces (if possible, fresh and cooled, but not frozen!) or  
fecal smear

**Liver and rumen fluke eggs** (*Fasciola*, *Dicrocoelium*) sedimentation

Detection of eggs

Material: at least 10 g feces

**Detection of skin parasites:**

**Mites** Microscopy, KOH procedure  
*Sarcoptes*, *Chorioptes*, *Psoroptes* mange, etc.

Material: deep skin scrapings

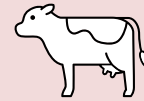
**Mallophaga, lice** Microscopy

Material: 3 transparent adhesive film strips per animal on microscope slides,  
combings and skin material

## CATTLE

### SEROLOGICAL TESTS (Antibody detection)

Material: serum or blood without anticoagulants



***Brucella spec.*** RBT

***Coxiella burnetii*** (Q fever) ELISA

on request

***Erysipelothrix rhusiopathiae*** (Erysipelas) SLA

***Leptospira*** MAT

Selected antigens of representative strains of different pathogenic serovars and serogroups

Testing for individual strains or serovars is possible after consultation

***Mycobacterium avium* subsp. *paratuberculosis*** ELISA

on request

***Mycoplasma* (*Mycoplasma*) *bovis*** ELISA

on request

**CATTLE**  
**PCR TESTS (Antigen detection)**



**Bovine Coronavirus** realtime PCR

Material: feces, rectal swabs, small intestine

**Campylobacter** differentiation PCR

Detection of *Campylobacter* spec., *C. coli* and *C. jejuni*

Material: feces, rectal swabs, small intestine

**Chlamydia** realtime PCR

Material: Genital swabs, conjunctival swabs, placenta, fetal liver, lung, spleen, genital organs

**Clostridioides (Clostridium) difficile** multiplex PCR

Detection of genes coding for toxin B and the binary toxin B

Material: feces, rectal swabs

**Leptospira** realtime PCR

Detection incl. differentiation of pathogenic *Leptospira*  
(subclades P1 and P2)

Material: Genital swabs, urine, sperm, kidney, fetal tissues (kidney, liver, lung), placenta, genital organs

**Mycobacterium avium subsp. paratuberculosis** PCR

Material: feces, rectal swabs, milk, mesenterial lymph nodes, small intestine

**Mycoplasma bovis (Mycoplasma) bovis** PCR

Material: synovia, milk, (sperm, BALF, lung)

**Rotavirus Group A and C** realtime PCR

Material: feces, rectal swabs, small intestine

**CATTLE**  
**MULTIPLEX PCR TESTS (Antigen detection)**



**Multiplex-PCR „Respiratory pathogens Cattle”**

Material: Nasal swabs, BALF, TBS, Tracheal swabs, lung

*Mycoplasma bovis*

*Histophilus somni*

*Pasteurella multocida*

*Mannheimia haemolytica*

Bovine Coronavirus

BRSV

PI3 Virus

## CATTLE

### SCREENINGS

#### Combinations of different examination methods



#### ***Mycobacterium avium* subsp. *paratuberculosis*** ELISA and PCR

Material: Milk on request

#### ***Mycoplasma* *bovis*** ELISA and PCR

Material: Milk on request

#### **Screening „Diarrhoea calf“**

Material: feces, rectal swabs, small/large intestine

Rotavirus Group A and C PCR

Bovine Coronavirus PCR

Detection of Parasites (Flotation)

*Cryptosporidia* special staining

Bacteriological culture for *E. coli* and *C. perfringens*

#### **Optional, if positive:**

typing *E. coli* (Multiplex-PCR for detection of 21 virulence associated factors)

typing *C. perfringens* (Multiplex PCR & Immunoblot)

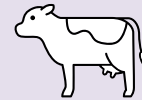
#### **Resistance / Susceptibility testing of bacterial isolates**

Agar diffusion test

Microdilution technique

(determination of the minimal inhibitory concentrations (MICs))

Microdilution technique anaerobes



### **Histological examination (standard staining)**

Special stainings (Ziehl-Neelsen, Gram, etc.)

### **Information for sampling technique**

Tissue samples for histological and immunohistological examinations should be sent in at least **10 times the volume** of 4 or 10% fixed formalin and should not be thicker than **1 cm** in at least one dimension to ensure a sufficiently rapid penetration with the fixing solution.

A cover letter with a clinical preliminary report is essential for the interpretation of the histological findings and the limitation of the deducible etiological differential diagnoses.

Immunohistological examinations for the specific detection of certain pathogens in the tissue are only useful, if a previous histological examination revealed morphological changes, which justify the suspicion of infection with the pathogen in question. Is the meaning, which a pathogen has played in a specific disease process, not of interest, but just the question, whether or not an animal was infected with the pathogen, a PCR analysis of unfixed tissue is preferable, due to its higher sensitivity.

**Necropsy of ruminants is not possible due to animal health legislation regulations.**



**Examination by bacteriological culture**, basic

**Examination by bacteriological culture incl. anaerobes**  
using enrichment and selective culture media

**Examination by bacteriological culture only *Salmonella*** according  
DIN EN ISO 6579 1 using enrichment and selective culture media  
**Note:** This is no official examination according to the federal regulations  
against Salmonellosis in Cattle (RindSalmV)

**Examination by bacteriological culture incl. *Salmonella*** according  
DIN EN ISO 6579 1 using enrichment and selective culture media  
**Note:** This is no official examination according to the federal regulations  
against Salmonellosis in Cattle (RindSalmV)

**Examination by bacteriological culture: *E.coli*, *Cl. perfringens* and  
*Salmonella*** according DIN EN ISO 6579 1 using enrichment and selective  
culture media  
**Note:** This is no official examination according to the federal regulations  
against Salmonellosis in Cattle (RindSalmV)

**Examination by bacteriological culture incl. *Mycoplasma***  
using selective culture media and enrichment culture  
Note: special transport medium can be made available

#### **Additional selective culture medium**

**Examination by bacteriological culture on milk (single milking)**  
incl. yeast and prototheka by using selective cultural media

Please note that the identification of pathogenic bacteria species may incur further costs for  
diagnostic verification, e.g. for species identification by PCR or 16S rRNA typing (PCR and  
sequencing° (by external lab) including sequence analysis).

Most suitable sample material for cultural detection of bacterial pathogens of:

<b>Arthritis</b>	swab from joint capsule or joint cartilage, (synovia)
<b>Respiratory infections</b>	lung, lung and bronchial swab, bronchoalveolar lavage fluid (BALF)
<b>Endometritis</b>	cervical swab
<b>Enteritis, Diarrhoea</b>	feces, fecal swab, rectal swab, small and large intestine
<b>Mastitis</b>	milk without eningeal swab, CSF (liquor)
<b>Meningitis</b>	meningeal swab, CSF (liquor)
<b>Rhinitis</b>	nasal swab
<b>Sepsis</b>	kidney, spleen

Note: **swabs with medium** are the most suitable for cultural examination.



**Identification of bacteria isolated at IVD as part of the cultural examination**

Identification of species by PCR:

*Clostridioides difficile*

*Fusobacterium necrophorum*

*Histophilus somni*

*Mannheimia haemolytica*

*Mycoplasma mycoides* (*Mycoplasma*) *bovis*

*Mycoplasma mycoides* (*Mycoplasma*) *bovirhinis*

*Pasteurella multocida*

*Staphylococcus chromogenes*

*Streptococcus parauberis*

*Streptococcus uberis*

16S rRNA sequencing° (for identification of any bacterial species)  
(by external lab)

ITS sequencing° (for identification of further mycological species)  
(by external lab)

Cultural biochemical or serological differentiation

**Resistance / Susceptibility testing of bacterial isolates**

Agar diffusion test

Microdilution technique

(determination of the minimal inhibitory concentrations (MICs))

Microdilution technique anaerobes

**Custodial storage of bacterial isolates / mycoplasma**

**Delivery of characterised bacterial field isolates**

e. g. *Mycoplasma*, *Mannheimia*, *Pasteurella* and others

**Examination by mycological culture for dermatophytes**

using enrichment and selective culture media

Material: Hair with root, skin scrapings,  
please disinfect the sampling point beforehand

Note: pre-register one week in advance, please

**microbiological disinfection control°**

Total bacterial count and viable count *E. coli*, *C. perfringens* and mold fungi

Note: pre-register one week in advance, please

**microbiological disinfection control°**

only total bacterial count

Note: pre-register one week in advance, please



**Identification / differentiation of submitted bacterial isolates**

by PCR

*Clostridioides difficile*

*Fusobacterium necrophorum*

*Histophilus somni*

*Mannheimia haemolytica*

*Mycoplasma* (*Mycoplasma*) *bovis*

*Mycoplasma* (*Mycoplasma*) *bovirhinis*

*Pasteurella multocida*

*Staphylococcus chromogenes*

*Streptococcus parauberis*

*Streptococcus uberis*

**Additional subculture for submitted bacterial isolates**

for further analysis

Identification of further bacterial species by 16S rRNA typing° by external laboratory

ITS sequencing° (for identification of further mycological species) by external laboratory

**Typing of bacterial isolates**

***Clostridioides (Clostridium) difficile*** multiplex PCR

Detection of the genes coding for toxin A and B and the binary toxins A and B

***Clostridium perfringens***

Determination of types A to F with/without  $\beta$ 2 toxin gene/enterotoxin gene by PCR and detection of  $\alpha$  and  $\beta$ 2 toxin production by immunoblot only by PCR

***Escherichia coli*** “**Virulence associated factors**” multiplex PCR

Detection of virulence-associated factor genes (fimbriae, adhesins, toxins, and other factors)

**MRSA Methicillin resistant *Staphylococcus aureus***

Detection of *mecA* gene by PCR and of expression of penicillin-binding protein 2 (PBP2) by agglutination

***Pasteurella multocida* capsule typing** PCR

Detection of capsular type A, B, D, E and F as well as haemorrhagic septicaemic (HS) capsular type B

***Salmonella* Serotyping** (according to the Kauffmann-White scheme)

Classification into serogroups A-E and F-67 by agglutination

***Staphylococcus aureus*. Methicillin resistant s. MRSA**



**Detection of parasite stages in feces** Sedimentation Flotation  
Helminth eggs, protozoan oocysts and cysts  
Material: at least 10 g feces

**Nematode larvae** Baermann-Wetzel migration technique  
of lung worms (*Dictyocaulus filaria*) and *Protostrongylidae*  
Material: at least 10 g feces

***Cryptosporidia*** Staining according to Heine  
Semi-quantitative direct detection of *Cryptosporidium* oocysts  
Material: 2-5 g feces (if possible, fresh and cooled, but not frozen!) or  
fecal smear

**Liver and rumen fluke eggs** (*Fasciola*, *Dicrocoelium*)  
Detection of eggs by sedimentation  
Material: at least 10 g feces

**Detection of skin parasites:**

**Mites** Microscopy, KOH procedure  
*Sarcoptes*, *Chorioptes*, *Psoroptes* mange, etc.  
Material: deep skin scrapings

***Mallophaga*, lice** Microscopy

Material: 3 transparent adhesive film strips per animal on microscope slides,  
combing and skin material



**Avian Metapneumovirus° PCR**

Subtypes A and B

Material: Pharyngeal swabs, lung, air sac/ bronchus swab

***Histomonas meleagridis*° PCR**

Material: feces, cloacal swabs, caecum

**Infectious Bronchitis Virus (IBV)° PCR**

Material: Pharyngeal swabs, lung, bronchus swab

**Marek Disease Virus (MD)° PCR**

Material: feces, cloacal swabs, feather follicles, liver, spleen, kidney, ovar, tumor tissue

***Mycoplasma*° PCR**

*Mycoplasma* (*Mycoplasma*) *gallisepticum* and

*Mycoplasma* (*Mycoplasma*) *synoviae*

Material: Pharyngeal swabs, lung, air sac/ bronchus swab

***Salmonella species* realtime PCR after cultural enrichment**

Material: feces, cloacal swabs, feather follicles, liver, spleen, kidney, ovar, tumor tissue, sock swabs, environmental swabs, bacterial isolates  
on request

***Salmonella-Enteritidis-Typhimurium* realtime multiplex PCR**  
Detection of *Salmonella* and identification of serovar Enteritidis and Typhimurium

Material: feces, cloacal swabs, feather follicles, liver, spleen, kidney, ovar, tumor tissue, sock swabs, environmental swabs, bacterial isolates  
on request



**Examination by bacteriological culture**, basic

**Examination by bacteriological culture incl. anaerobes**

using enrichment and selective culture media

**Examination by bacteriological culture incl. *Salmonella* of feces**

according to DIN EN ISO 6579-1 using enrichment and selective culture media

**Examination by bacteriological culture ONLY for *Salmonella* of feces and Sock swabs**

according to DIN EN ISO 6579-1 using enrichment and selective culture media

***Salmonella* Serotyping** (according to the Kauffmann-White scheme)

Classification into serogroups A-E and F-67 by agglutination

***Salmonella* Serotyping of TOP5 Serovars** (according to the Kauffmann-White- Le-Minor scheme)

Detection *S. Enteritidis*, *S. Typhimurium*, *S. Infantis*, *S. Virchow*, *S. Hadar* by agglutination

**Differentiation of *Salmonella* spp. vaccine and field strains**

Differentiation of the vaccine strains of Cevac Salmovac

**Examination by bacteriological culture incl.**

***Yersinia pseudotuberculosis***

using selective culture media - on request

**Examination by bacteriological culture incl. *Mycoplasma***

using selective culture media and enrichment culture

**Additional selective culture medium**

Please note that the identification of pathogenic bacteria species may incur further costs for diagnostic verification, e.g. for species identification by PCR or 16S rRNA typing (PCR and sequencing° (by external lab) including sequence analysis).

**Identification of further bacterial species by 16S rRNA sequencing°**

(by external lab)

ITS sequencing° (for identification of further mycological species)

(by external lab)

Cultural biochemic and serologic differentiation

**Custodial storage of bacterial isolates / mycoplasma**



**microbiological disinfection control°**

Total bacterial count and viable count *E. coli*, *C. perfringens* and mold fungi

Note: pre-register one week in advance, please

**microbiological disinfection control°**

only total bacterial count

Note: pre-register one week in advance, please

**Resistance / Susceptibility testing of bacterial isolates**

Microdilution technique (determination of the minimal inhibitory concentrations (MICs))

Microdilution technique anaerobes

More diagnostic using selective media are possible on request:

- *Mycobacteria*
- skin fungi
- differentiation between *Aspergillus flavus* and *A. niger*

**Identification of bacterial isolates (prices incl. culture)**

*Avibacterium gallinarum* / *paragallinarum*

*Bordetella avium*

*Clostridium colinum*

*Clostridium perfringens*

*Enterococcus cecorum*

*Enterococcus faecalis*

*Enterococcus hirae*

*Erysipelothrix rhusiopathiae* (Erysipelas Erreger)

*Escherichia coli*

*Gallibacterium anatis*

*Mycoplasma* (*Mycoplasma*) *gallisepticum* and

*Mycoplasma* (*Mycoplasma*) *synoviae*

*Ornithobacterium rhinotracheale* (ORT)

*Pasteurella multocida*

*Riemerella anatipestifer*

*Salmonella* species

*Staphylococcus aureus*. MRSA diagnostic is possible s. MRSA

*Streptococcus zooepidemicus*. and further *Streptococci*

*Yersinia pseudotuberculosis*



Most suitable sample materials for cultural detection of bacterial pathogens of:

<b>Arthritis</b>	Swabs of joint capsule or cartilage, (synovia)
<b>Respiratory infections</b>	Lung, air sac, lung/bronchus swabs, pharyngeal swabs
<b>Skin lesions</b>	dermal swabs, abscess content or swabs from abscesses
<b>Inflammation of ovary duct</b>	cloacal swabs
<b>Enteritis, diarrhoea</b>	feces, cloacal swabs, rectal swabs, small /large intestine
<b>Meningitis</b>	meningeal swabs, CSF (Liquor)
<b>Sepsis</b>	kidney, spleen
<b>Serositis</b>	serosal swabs

Note: **swabs with medium** are the most suitable for cultural examination.



### Typing of bacterial isolates

#### ***Clostridium perfringens***

Determination of types A to F with/without  $\beta$ 2 toxin gene/enterotoxin gene by PCR and detection of  $\alpha$  and  $\beta$ 2 toxin production by immunoblot nur PCR

#### **MRSA Methicillin resistant *Staphylococcus aureus***

Detection of the mecA-Gen by PCR and expression of the Penicillin binding Protein 2 (PBP2) by agglutination

#### ***Pasteurella multocida* capsule typing PCR**

Detection of capsular type A, B, D, E and F as well as haemorrhagic septicaemic (HS) capsular type B

#### **Additional subculture of submitted bacterial isolates**

for further analysis

## POULTRY PARASITOLOGY°



### **Information concerning the parasitological examination of feces:**

For the parasitological examination fresh fecal samples or pool samples from 3 consecutive days are most useful.

### **Detection of parasite stages in feces**

Helminth eggs, protozoan oocysts and cysts

incl. *Eimeria* spp., *Ascaridia galli*, *Capillaria contorta*, *C. annulate*, *C. obsignata*, *C. caudinflata*, *Syngamus trachea*, *Heterakis gallinarum*, *Davainea proglottina*, *Railletina echinobothridia* etc.

### **Sedimentation-Flotation (qualitative, semi-quantitative)**

Material: at least 10 g feces, sock swabs

### **Modified McMaster procedure (quantitative)**

Determination of eggs/ oocyst per gram feces

threshold: 50 EPG/OPG

Material: at least 10 g feces, sock swabs

## **Mites**

### ***Dermanyssus gallinae* (Poultry Red Mites), Air sac mites**

Makroskopy, Mikroskopy

Material: carcasses

### **Scaly leg mites (*Knemidocoptes mutans*) Mikroskopy, KOH-method**

Material: skin from altered legs

### **Feather mites, Fleas, *Mallophagida*, Lice Mikroskopy**

Material: 3 transparent adhesive film strips per animal on microscope slides, skin material, carcasses

## POULTRY PATHOLOGY



## **NECROPSY**

incl. final disposal of animal carcasses  
per animal

## HISTOLOGY



### **Histological examination**

per sample

### **Information for sampling technique**



Tissue samples for histological examinations should be sent in at least **10 times the volume** of 4 or 10% fixed formalin and should not be thicker than **1 cm** in at least one dimension to ensure a sufficiently rapid penetration with the fixing solution.

A cover letter with a clinical preliminary report is essential for the interpretation of the histological findings and the limitation of the deducible etiological differential diagnoses.

### **LIST OF ABBREVIATIONS**

BALF	broncho-alveolar lavage fluid
CNS	central nervous system
CSF	cerebrospinal fluid, <i>Liquor cerebrospinalis</i>
EDTA	ethylene diamine tetraacetic acid sodium salt
ELISA	enzyme-linked immunosorbent assay
HI	hemagglutination inhibition test
IFAT	immunofluorescence antibody test
IHA	indirect hemagglutination assay
IHC	immunohistochemistry
CFT	complement fixation test
MAT	microscopic agglutination test
PCR	polymerase chain reaction
qPCR	quantitative polymerase chain reaction
RBT	Rose Bengal test
rtPCR	realtime polymerase chain reaction
SLA	serum agglutination test
TBS	tracheobronchial secretion

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**IVD GmbH**  
Amtsgericht Hannover HRB 56590  
**Albert-Einstein-Str. 5**  
**30926 Seelze-Letter**  
**Germany**

Managing partners:  
Dr. Katrin Strutzberg-Minder  
Dr. Matthias Homuth  
Jens-Peter Minder

Phone + 49 (0) 511 2200 29-0  
Fax + 49 (0) 511 2200 29-99  
E-Mail: [service@ivd-gmbh.de](mailto:service@ivd-gmbh.de)  
[www.ivd-gmbh.de](http://www.ivd-gmbh.de)

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