

Methicillin-resistant *Staphylococcus aureus* (MRSA)

ANIMAL GROUP AFFECTED	TRANSMISSION	CLINICAL SIGNS	FATAL DISEASE ?	TREATMENT	PREVENTION & CONTROL
Ruminants, Equids, Canids, Felids, Pigs, bats, turtles, seals, birds, elephant, humans	direct contact, nosocomial	Opportunistic infections wounds, skin and soft tissue (variety of infections: pyoderma, otitis, metritis, mastitis, omphalophlebitis, sinusitis, osteomyelitis, abscesses, urinary tract infections, pneumonia)	range from mild and superficial infections to rapidly fatal	Vancomycin, broad-spectrum cephalosporine	<i>In houses</i> hygiene <i>in zoos</i> hygiene, quarantine

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Susceptible animal groups MRSA infections are reported from a wide range of animals (Ruminants, Equids, Canids, Felids, pigs, bats, turtles, seals, birds, elephant, humans). MRSA colonisation does not necessarily lead to infection, as evidenced by identification of MRSA colonisation in clinically normal animals, but various opportunistic infections can develop. Specially in pet animals infections have become more prevalent in the last years what is considered to be a consequence of the emergence of MRSA in humans. Identical strains in pet animals and their owner support the hypothesis that humans can act as a source of infection. In contrast MRSA strains isolated from other animal species like horses or pigs seem to be animal-adapted. Data of the occurrence in zoo animals are scarce. A recent case of an infection in an elephant calf and further animal to human transmission (animal keepers) is described.	
Causative organism Methicillin-resistant <i>Staphylococcus aureus</i> MRSA (resistant to all beta-lactam antimicrobials: penicillin, carbapenems due to an altered penicillin-binding protein PBP)	
Zoonotic potential Human MRSA infections with epidemiological link to animal contact in veterinary personnel, pet owners and farm animal workers are reported. Transmission from infected or colonized animals to humans and vice versa via contact with contaminated body fluids is possible. MRSA in animals can be of human or animal origin. MRSA strains isolated from household pets are typically human strains, that were most probably acquired from human contact. In contrast MRSA strains isolated from other animal species like horses or pigs seem to be animal-adapted.	
Distribution Worldwide	
Transmission Direct contact, nosocomial	
Incubation period	

Clinical symptoms			
Clinical symptoms are dependent on infection route. Opportunistic infections of wounds (also surgical sites), skin and soft tissue (variety of infections: pyoderma, otitis, metritis, mastitis, omphalophlebitis, sinusitis, osteomyelitis, abscesses, urinary tract infections, pneumonia)			
Post mortem findings			
Post mortem findings vary depending on infection site and clinical picture.			
Diagnosis			
Culture (Oxoid Brilliance MRSA agar, enrichment with Mueller-Hinton-broth with 6,5% NaCl) and susceptibility testing, PCR			
Material required for laboratory analysis			
Wound swabs, blood, urine, nasal swabs			
EU Reference Laboratory			
/			
OIE Reference Laboratories in Europe			
/			
National Reference Laboratories			
Austria	Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH Institut für Medizinische Mikrobiologie und Hygiene Beethovenstrasse 6 8010 Graz	Latvia	
Belgium	Veterinary and Agrochemical Research Center (CODA-CERVA-VAR) Groeselenberg 99 1180 Brussels	Lithuania	
Bulgaria	National Center of Infectious and Parasitic Diseases 26 Yanko Sakazov Blvd 1504 Sofia	Luxemburg	
Czech rep	State Veterinary Institute Olomouc Jakoubka ze Stribra c.1 779 00 Olomouc	Malta	
Cyprus		Netherlands	Central Institute for Animal Disease Control – Lelystad P.O.Box 2004 8203 AB Lelystad
Denmark	The National Food Institute Bülowsvej 27 DK-1790 Copenhagen V	Poland	
Estonia		Portugal	
Finland	Kansanterveyslaitos (National Public Health Institute) Department of Microbiology Laboratory for Hospital Bacteriology	Romania	
France	AFSSA Ploufragan – LERAP Unité Mycoplasmologie-Bactériologie BP 53 22440 Ploufragan	Slovakia	State Veterinary and Food Institute Janoskova 1611/58 Dolny Kubin
Germany	Federal Institute for Risk Assessment (BfR) 4Z Centre for Infectiology and Pathogen Characterisation Diedersdorfer Weg 1 D-12277 Berlin	Slovenia	National Veterinary Institute Vet Faculty Laboratory for Bacteriology and Mycology Gerbiceva 60 1000 Ljubljana



Greece		Spain	Laboratorio de Vigilancia Sanitaria VISAVET Facultad de Veterinaria de la Universidad Complutense de Madrid Avenida Puerta de Hierro s/n 28040 Madrid
Hungary	Central Agricultural Office Veterinary Diagnostical Directorate Department of Bacteriology Tábornok u.2. XIV Budapest	Sweden	National Veterinary Institute (SVA) Travvägen 20 75189 Uppsala
Ireland		United Kingdom	The Veterinary Laboratory Agency Bury St. Edmunds, Rougham Hill Suffolk, IP33 2RX
Italy	Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana Via Appia Nuova 1411 00178 Roma	(Norway)	National Veterinary Institute PO Box 8156 Dep. N-0033 Oslo
		(Switzerland)	
Relevant diagnostic laboratories			
Treatment Hygiene measures, antimicrobial (vancomycin, broad-spectrum cephalosporine)			
Prevention and control in zoos Hygiene measures (proper hand hygiene before and after animal contact, personal protective equipment when working with infected animals, cleaning and disinfection of contaminated equipment and surfaces), quarantine of infected animals			
Suggested disinfectant for housing facilities Terminal cleaning; alcohol, quarternary ammonium, non-flammable alcohol vapour in carbon dioxide			
Notification			
Guarantees required under EU Legislation			
Guarantees required by EAZA Zoos			
Measures required under the Animal Disease Surveillance Plan			
Measures required for introducing animals from non-approved sources			
Measures to be taken in case of disease outbreak or positive laboratory findings			
Conditions for restoring disease-free status after an outbreak			
Contacts for further information			

References

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