GV-SOLAS
Gesellschaft für Versuchstierkunde
Society for Laboratory Animal Science

Expert Information

From the Working Group on Hygiene

Implication of infectious agents on results of animal experiments

Corynebacterium bovis

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Contents

Corynebacterium bovis

Background

- First description and isolation from cattle in 1962[1]
- First isolation from (athymic) mice in 1995[2]

Prevalence

- *Corynebacterium* (*C.*) *bovis* is one of the most prevalent organisms isolated from bovine milk, its pathogenicity regarding bovine mastitis is discussed.[1,3]
- Monitoring of immunodeficient mice with scaly skin lesions revealed that 2% of microbiological cultures and 9% of PCR assays were positive *for Corynebacterium bovis.*[4]
- *Corynebacterium bovis* was also isolated from a chronic testicular abscess and the lung of a laboratory rabbit.[5]
- Up to 4% of cultured cell lines and 13% of solid tumor tissue samples were contaminated with *Corynebacterium bovis* DNA.[6]

Host species

- Mouse[2,7], rat[8], rabbit[5]
- Evidence in mouse colonies is reported for North America[2], Europe[9] and Asia[10]
- Major host: cattle[1,3]
- *Corynebacterium bovis* was identified as the causal agent for hyperkeratotic dermatitis (so-called scaly skin disease) in athymic mice in 1995.[2]

Properties

- Gram-positive, rod-shaped, non spore-forming, facultative anaerobic bacterium[11,2,9] with different virulence and pathogenicity of strains[12,13]
- Transmitted between animals by direct contact[5], spreads rapidly to naïve nude mice.[9]
- Transmission via fomites, for instance, gloves of animal caretakers or by transplantable tumor lines[9]
- Persistent in the environment, lipophilic, survives well on skin flakes or other organic material, only sensitive to heat and certain chemical disinfectants.[9]
- Very difficult to eradicate[14,15]

Susceptibility

- Immunocompetent and immunodeficient mice and rats can be infected, both glabrous and hirsute.[7,8]
- Glabrous mice are prone to develop hyperkeratosis.[7,9]
- Nude (*Foxn1*^{nu}), hairless (*Hr*^{hr})[2], SCID (*Prkdc*^{scid}), and NSGS mice develop clinical signs and histological findings.[9,16]

Organotropism

- Skin[1,2]
- Mucous membranes of oral cavity and nose[2]

Clinical disease

- Scaly skin disease of athymic mice has been reported since 1976[2,13]
- Hyperkeratotic dermatitis (also called scaly skin disease) is most commonly observed in homozygous nude mice.[2,9]
- Euthymic hairless mice may also develop scaly skin disease.[2]
- SCID mice may develop alopecic areas, with small white flakes involving the dorsum, flanks, neck and cheeks; acanthosis and hyperkeratosis may be observed histologically.[7]
- NSGS mice develop periocular and facial hyperkeratosis and alopecia.[16]
- Cattle mastitis[1], rabbit abscesses[5], inflammations in different organs of human[17]

Pathology

- Dyskeratotic hair follicles with squamous metaplasia along the hair root[18]
- Marked acanthosis, moderate orthokeratotic hyperkeratosis, dermal mononuclear cell infiltrate[2]

Morbidity and mortality

- Usually inapparent infection for immunocompetent and hirsute animals[19]
- High morbidity (80%) but low mortality (1%) in affected adult hairless mice[7,20]
- Suckling mice have high mortality up to 100%.[18]
- The lesions tend to resolve spontaneously and disappear within 7-10 days.[2,8]

Zoonotic potential

- Unclear; some cases of human diseases have been reported.[14,17,21,22]

Interference with research

Oncology

- Tumor growth rate may be depressed.[18,20]
- Engraftment of xenografts is retarded, NK cell activity may be affected.[18,20]
- In the NSGS mouse model of chronic myelomonocytic leukemia (CMML), *C. bovis* infection results in diminished human CMML engraftment, including less thrombocytopenia, less splenomegaly, fewer CMML infiltrates in histopathologic sections of murine organs, and fewer human CD45+ cells in samples from spleen, bone marrow, and peripheral blood.[16]

Teratology

- No data

Infectiology

- No data

Immunology

- No data

Interactions with other infectious agents

- *Corynebacterium bovis* infection of the mammary gland in mice has an influence on subsequent infection with *Staphylococcus aureus.*[12]

Toxicology

- No data

Physiology

- Increased water consumption (2x) and urine production[2,20]
- Significant weight loss[19], probably due to anorexia and dehydration or depressed growth rate

Cell biology

- No data

Assisted reproductive technology

- No data

Special considerations

- No data

Updated by Karin Jacobi, Berlin, March 2019 and Michael Mähler, Hannover, February 2021

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