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Research Article

Infection with *Rothia mucilaginosa*: Review of Findings at a Danish Tertiary Hospital and Reports in Literature

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Received: September 01, 2019; **Published:** October 11, 2019

Abstract

Rothia mucilaginosa is a Gram-positive coccus which can be found as a commensal in the oral cavity and upper respiratory tract. It has also been reported in cases of infection worldwide, and most commonly in immunosuppressed hosts. The aim was to create an overview of cultures positive for *R. mucilaginosa* from Rigshospitalet, and review the current literature describing cases of infection caused by *R. mucilaginosa.*

In the hospital laboratory database, *R. mucilaginosa* was identified in samples from 46 patients over a two-year period. Identifications were found in a variety of samples, most often in sites associated with the upper airways or gastrointestinal tract. In the literature review, 118 patients were reported with infection caused by *R. mucilaginosa*, most commonly presenting with bacteremia or sepsis.

A comparison is made between the findings in the laboratory database and the literature review. Hospital findings can often be suspected to be contamination from the oral flora and is not estimated of great clinical importance. The infectious potential of *R. mucilaginosa* is not well established, but the route of infection is suspected to be translocation from the oral cavity into the bloodstream. The patient history and co-morbidities should be considered when investigating the infectious potential.

Keywords: *Rothia mucilaginosa; Review; Infection; Commensal Bacteria*

Introduction

Rothia mucilaginosa is a Gram-positive, facultatively anaerobic, nonmotile coccus with a respiratory and fermentative metabolism [1,2]. It is a common inhabitant of the human oral microbiota and is therefore naturally found in the oral cavity and pharynx [3]. It shares many similarities with species of *Staphylococcus, Micrococcus* and *Streptococcus*, which makes it difficult to distinguish them by morphology [4]. However, its variable catalase reaction, inability to grow in media with 5% NaCl and ability to ferment sucrose and glucose, can be used to differentiate it from its close relatives [5,6].

The first infection with *R. mucilaginosa* was reported in a case of endocarditis in 1978, when the species was named *Micrococcus mucilaginosus* [4]. In 1982, metabolic and morphological analysis showed that it was different from other *Micrococcus* species and it was reclassified as *Stomatococcus mucilaginosus* [2]. It was reclassified again in 2000 as *Rothia mucilaginosa* based on 16S rRNA sequencing

of a mouse isolate [3]. Literature suggests that *R. mucilaginosa* is most often found as a pathogen in immunocompromised individuals [1]. Because it is a common inhabitant of the human oral cavity and respiratory tract, development of oral mucositis or dental surgery can predispose to infection [7].

Aim of the Study

The aim of this study was to provide an overview of cultures positive for *R. mucilaginosa* at Copenhagen University Hospital (Rigshospitalet) as well as review the published cases where *R. mucilaginosa* was the disease-causing agent. This study will gain insight in the distribution of laboratory findings and discuss how to evaluate the clinical relevance of a culture positive for *R. mucilaginosa*.

Methods

Hospital database search

The microbiological database MADS (Mikrobiologisk Afdelings Data System, Aarhus University Hospital, Denmark) used at Rigshospitalet was searched for culture findings of *R. mucilaginosa* from all clinical samples in the past two years (2017 and 2018), either by culturing or 16S rRNA sequencing.

Literature Review

Three databases were searched for case reports of infection with *R. mucilaginosa*; REX (The Royal Danish Library, www.rex.kb.dk), PubMed (US National Library of Medicine National Institutes of Health, www.ncbi.nlm.nih.gov/pubmed), and Scopus (Elsevier, www.scopus.com). The search terms were "*Rothia mucilaginosa*", "*Micrococcus mucilaginosus*" and "*Stomatococcus mucilaginosus*" and only case reports describing human infection were included. The search was last repeated the 3. December 2018.

Results

Hospital database search

The search resulted in 52 positive samples from 46 patients, and both samples with mono- and polymicrobial findings were included. Patients with more than one positive sample with *R. mucilaginosa* from the same location and the same sample date were only included once. *R. mucilaginosa* was found from a wide variety of samples, but most often from the gastrointestinal tract with a total of 15 positive samples (32,6%) (Table 1). *R. mucilaginosa* was also isolated from upper and lower airways with a total of 12 positive samples (26,1%), and another 12 positive samples (26,1%) were found in other locations such as tissue samples and breastmilk (Table 1). In our laboratory database review, a total of 7 samples (15,2%) were isolated from sterile sites including blood, cerebrospinal fluid and bone.

Of the total 46 patients with positive samples, 26 patients (56,5%) were males and 20 patients were females (43,5%). Most age groups were represented (0-75 years) with the mean age being 43 years.

Literature Review

The literature search resulted in 65 publications describing isolation of *R. mucilaginosa* in 118 patients. Patients of all age groups were represented (1-91 years), the age median was 37 years, and the gender distribution was 43 females (36,4%), 67 males (56,8%) and 8 unknown (6,8%). Cases were most frequent from Europe (60 cases) and North America (50 cases).

R. mucilaginosa was found to cause infection related to the gastrointestinal tract, respiratory areas, invasive infections and several other sites (Table 2-5). The most common infection types were sepsis (36 cases, 30,5%) and bacteremia (33 cases, 27,9%) as well as meningitis (17 cases, 14,4%) and pneumonia (16 cases, 13,5%). 3 of the cases presenting with bacteremia further developed into sepsis (8 - 10). Cases of endocarditis, peritonitis, lung abscess, endophthalmitis, keratitis, and prosthetic joint infection were also described in more than one case, whereas infective arthritis, necrotizing fasciitis, spondylodiscitis, typhlitis and cholangitis were only reported in one case each. 22 cases presented with a polymicrobial infection at the infection site.

Gastrointestinal tract				
Localization	**Number of samples**	**Culture**	**Gender**	**Age**
Oral cavity (b)	2	Mixed	Male, Female	38, 15
Tongue (b, t)	3	Mixed	Male, 2 Females	32, 34, 67
Jaw (b, t, p)	3	Mixed	2 Males, Female	30, 35, 54
Esophagus (b)	3	Mixed	Male, 2 Females	34, 59, 67
Duodenum (b)	2	Mixed	2 Males	53, 54
Gallbladder fluid (f)	1	Mixed	Male	15
Pancreatic fluid (f)	1	Mixed	Male	74
Upper airways				
Sinus (p, se)	2	Mixed	Male	65, 75
Pharynx (p, se)	2	Mixed	Male	65, 66
Larynx (b)	1	Mixed	Male	67
Tracheal secretions (se)	1	Mixed	Male	67
Tonsil (t)	1	Mixed	Male	44
Lower airways				
BAL (f)	2	Mono	Female	2, 4
Pleural effusion (f)	1	Mixed	Male	54
Lung (b)	2	Mixed	Male	58, 66
Sterile sites				
Blood culture (f)	3	Mono, Mixed	2 Males, Female	0, 13, 57
CSV (f)	2	Mixed	Male	38, 43
Bone (t)	1	Mono	Female	53
N/A (f)	1	Mixed	Male	67
Other locations				
Breastmilk (f)	7	Mixed	Female	26, 29, 29, 30, 30, 30, 35
Eye (sw)	1	Mono	Female	0
Lymph node (t)	1	Mixed	Male	51
Sternum (t)	1	Mixed	Female	39
Rectum (t)	1	Mixed	Male	57
Hand (t)	1	Mixed	Female	56

Table 1. *Samples positive for R. mucilaginosa derived from the gastrointestinal tract, upper and lower airways, sterile sites and other locations within the years 2017-2018 at Rigshospitalets Department of Clinical Microbiology.*

b: Biopsy; BAL: Bronchoalveolar Lavage; f: Fluid; p: Pus; se: Secretions; sw: Swab; t: Tissue; N/A: Localization not available, and the indication for sampling on the order form was stated as: "suspected infection in relation to vascular graft prosthesis". "Localization" is as written on the order form. "Culture" is indicated as either "Mono", indicating that only R. mucilaginosa was present, or "Mixed" indicating that at least one species of bacteria was isolated from the sample. "Age" is reported in full years.

Reference	Gender	Age (years)	Risk factors	Infection type	Co-infection
[13]	Male	58	Diabetes mellitus, end-stage renal disease, peritoneal dialysis	Peritonitis	*Streptococcus mitis*
[14]	Male	60	HIV-associated nephropathy, end-stage renal disease, peritoneal dialysis	Peritonitis	None
[15]	Female	41	End-stage renal disease, peritoneal dialysis	Peritonitis	None
[16]	Female	44	End-stage renal disease, peritoneal dialysis	Peritonitis	None

Table 2: *Previous reports of R. mucilaginosa gastrointestinal infection in the literature.*

Reference	Gender	Age (years)	Risk factors	Infection type	Co-infection
[17]	Female	56	Chronic obstructive pulmonary disease, bronchiectasis	Pneumonia	None
[18]	Male	61	Chronic obstructive pulmonary disease	Pneumonia	None
[12]	Female	46	Lymphoblastic lymphoma, liver abscess	Pneumonia	Rhinovirus
[19]	Male	60	Recurrent lower respiratory tract infections, Felty syndrome	Pneumonia, lung abscess	*Streptococcus viridans*
	Female	75	Prednisolone and methotrexate treatment	Lung abscess	*Streptococcus viridans*
	Female	68	Polymyalgia rheumatica	Pneumonia	None
	Female	69	Chronic lung disease	Bronchitis	None
	Male	61	None	Bronchitis, Pneumonia	*Staphylococcus aureus*
	Male	72	Chronic lung disease	Pneumonia, lung abscess	*Streptococcus viridans*
	Female	64	Rheumatoid arthritis, Methotrexate treatment	Pneumonia	*Streptococcus viridans*
	Male	28	None	Pneumonia	None
[20]	Male	43	HIV-positive	Pneumonia	None
[21]	Unknown	45	Liver transplant recipient	Pneumonia	None
[22]	Male	21	AIDS	Lower respiratory tract infection	None
[23]	Male	26	HIV-positive, AIDS	Pneumonia	*Pneumocystis carinii*

Table 3: *Previous reports of R. mucilaginosa respiratory infection in the literature.*

Reference	Gender	Age (years)	Risk factors	Infection type	Co-infection
[24]	Male	19 months	Prematurely born, bronchiolitis	Bacteremia	None
[11]	Male	4	Downs syndrome, acute lymphoblastic leukemia, oral aphtha	Bacteremia	None
[8]	Male	54	Hypertension, type II diabetes mellitus, acute myeloid leukemia, dental procedure, bone marrow transplant	Bacteremia, typhlitis	None
[25]	Female	53	Rheumatoid arthritis, joint prosthesis	Prosthetic joint infection	None
[5]	Male	13	Acute myeloid leukemia, stem cell transplant	Meningitis, sepsis	None
	Male	21	Chronic myeloid leukemia, stem cell transplant	Meningitis	None
	Male	12	Acute lymphoblastic leukemia, stem cell transplant	Sepsis	None
	Female	7	Acute lymphoblastic leukemia	Sepsis, meningitis	None
	Male	4	Acute myeloid leukemia, stem cell transplant	Sepsis, pneumonia	None
	Female	6	Acute myeloid leukemia	Sepsis	None
	Female	7	Acute lymphoblastic leukemia	Sepsis	None
	Female	0,7	Acute lymphoblastic leukemia	Sepsis	None
	Male	17	Acute lymphoblastic leukemia	Sepsis	None
	Male	8	Acute myeloid leukemia	Sepsis	None
	Male	15	Non-Hodgins lymphoma	Sepsis	None
[1]	Male	36	Intravenous drug use, prosthetic valve	Prosthetic valve endocarditis	None
[9]	Male	44	Adult onset Still's disease	Bacteremia	None
	Female	75	Type 2 diabetes mellitus, hepatitis C, chronic renal failure, hemodialysis	Bacteremia	None
[26]	Female	52	Former intravenous drug use, bioprosthetic replacements of mitral and aortic valves	Prosthetic valve endocarditis	None
	Male	21	Acute lymphocytic leukemia, Omaya reservoir	Meningitis	None
[27]	Female	73	Type 2 diabetes mellitus, intraarticular corticosteroid injections, osteoarthritis	Infective arthritis	None
[28]	Male	66	Hypertension, pacemaker	Endocarditis	None
[29]	Male	52	Acute myeloid leukemia	Bacteremia	*Streptococcus salivarius*
	Female	54	Acute myeloid leukemia	Sepsis	None
	Male	44	Acute myeloid leukemia, oral mucositis	Sepsis	*Fusobacterium nucleatum*
	Female	26	Acute lymphoblastic leukemia	Sepsis	None
[30]	Male	11	Acute myeloid leukemia, stem cell transplant, mucositis	Meningitis	None
	Female	13	Acute myeloid leukemia, immunotherapy	Meningitis	None
[31]	Female	2 months	None	Meningitis	None
[32]	Male	59	Hip arthroplasty, diabetes type II, dental extraction	Prosthetic joint infection	None

[33]	Male	3	Shwachman-Diamond Syndrome	Bacteremia	None
[34]	Female	43	None, dental procedure	Spondylodiskitis	None
[35]	Female	53	Breast cancer	Bacteremia	None
	Female	58	Non-Hodgins Lymphoma	Sepsis	*Fusobacterium nucleatum*
	Female	45	Acute lymphoblastic leukemia	Sepsis	None
	Male	20	Acute lymphoblastic leukemia, oral mucositis	Sepsis	*Klebsiella aerogenes, Streptococcus sanguinis*
	Male	53	Acute myeloid leukemia	Sepsis	None
[36]	Male	44	Mitral valve prolapse	Endocarditis	None
[10]	Male	2,5	Acute lymphoblastic leukemia, Hickman central venous catheter, oral mucositis	Meningitis, bacteremia	*Staphylococcus aureus*
[37]	Female	60	Acute lymphocytic leukemia	Meningitis, bacteremia	None
[38]	Female	24	Acute myelogenous leukemia	Sepsis, pneumonia	
[39]	Male	16	Acute lymphoblastic leukemia, oral mucositis	Sepsis	None
[40]	Male	48	Multiple myeloma, central venous catheter, stem cell transplant	Meningitis	None
[41]	Male	5	Acute lymphoblastic leukemia, Hickman catheter	Meningitis, bacteremia	*Streptococcus mitis*
[42]	Male	14	Acute lymphoblastic leukemia, subclavian catheter	Meningitis, bacteremia	*Streptococcus mitis*
[43]	Male	14	Acute myeloid leukemia	Meningitis, bacteremia	None
	Male	46	Acute myeloid leukemia	Meningitis, bacteremia	None
[44]	Female	2	Non-Hodgkin lymphoma	Meningitis	None
[45]	Male	10	Acute lymphoblastic leukemia, anemia, thrombocytopenia, leukocytosis, chemotherapy	Sepsis	None
[46]	Male	68	Rheumatic heart disease, diabetes mellitus, aortic valve prosthesis	Bacteremia	None
	Female	37	Intravenous drug use	Bacteremia	*Streptococcus mutans, Streptococcus intermedius*
[47]	Female	18	None	Bacteremia	None
	Female	83	Immunoblastic lymphoma, chemotherapy	Bacteremia	*Streptococcus sanguinis*
	Male	64	Carcinoma of the palate	Bacteremia	None
	Female	2	Acute lymphoblastic leukemia, Hickman catheter	Bacteremia	None
	Male	13	Paroxysmal tachycardia	Bacteremia	None
	Male	27	Chronic granulocytic leukemia, Hickman catheter, periodontitis	Bacteremia	None
	Female	20	Acute nonlymphocytic leukemia	Bacteremia	None

[48]	Unknown	Infant	Prematurely born, percutaneous vascular catheter	Meningitis, sepsis	None
[7]	Male	29	Acute myeloid leukemia, oral mucositis	Meningitis	None
	Female	68	Acute myeloid leukemia, oral mucositis	Bacteremia	None
	Male	23	Bone marrow transplant, central venous catheter, oral mucositis	Bacteremia	None
	Female	34	Acute myeloid leukemia, bone marrow transplant, oral mucositis	Bacteremia	None
	Unknown	Unknown	Acute myeloid leukemia, oral mucositis	Bacteremia	None
	Unknown	Unknown	Acute myeloid leukemia, oral mucositis	Bacteremia	None
	Unknown	Unknown	Bone marrow transplant, oral mucositis	Bacteremia	None
	Unknown	Unknown	Acute myeloid leukemia, oral mucositis	Bacteremia	None
[49]	Male	11	Acute lymphoblastic leukemia	Meningitis, bacteremia	*Streptococcus mitis*
[50]	Female	13	Osteogenic sarcoma	Sepsis	None
	Male	2	Yolk sac tumor	Sepsis, pneumonia	None
	Male	53	Leukemia, Hickman catheter	Sepsis	None
	Female	80	Pulmonary emboli	Sepsis	None
	Male	1	Short-bowel syndrome	Sepsis	None
	Male	54	Vascular disease, diabetes	Sepsis	None
	Male	4	Leukemia	Sepsis	Polymicrobial
	Male	28	AIDS, neurotoxoplasmosis	Sepsis	Polymicrobial
	Male	9	Neuroblastoma	Sepsis	None
	Female	36	Ovarian cancer	Sepsis	None
[23]	Male	30	HIV-positive	Bacteremia	None
[51]	Unknown	Unknown	Leukemia	Sepsis	None
	Unknown	Unknown	Leukemia	Sepsis	None
[52]	Female	57	Pancytopenia, aplasia	Bacteremia	None
[53]	Female	87	Sub-dural hematoma	Bacteremia	None
[54]	Female	31	Hodgkin's disease, bone marrow transplant	Sepsis	None
[55]	Male	35	Intravenous drug use, aortic valve replacement	Endocarditis	None
[56]	Male	79	Liver cirrhosis	Sepsis	None
[57]	Male	33	Intravenous drug abuse, prosthetic valve	Prosthetic valve endocarditis	None
[58][a]	Male	29	Intravenous drug use, bio prosthesis	Prosthetic valve endocarditis	None
[59]	Female	34	Intravenous drug abuse	Endocarditis	None
[60]	Male	84	Esophagus cell carcinoma	Sepsis	None
[61]	Male	46	Mitral valve prolapse	Endocarditis	None
[4]	Male	63	Arteriosclerotic, rheumatic heart disease, mitral stenosis, cardiac catheterization	Endocarditis	None

Table 4: *Previous reports of R. mucilaginosa invasive infection in the literature.*

Reference	Gender	Age (years)	Risk factors	Infection type	Co-infection
[62]	Male	89	Diabetes mellitus, cataract surgery	Keratitis	None
[63]	Female	65	Conjunctival injection	Endophthalmitis	None
[64]	Male	41	Glaucoma surgery	Endophthalmitis	None
[65]	Female	58	Corneal ulcer, corneal epitheliopathy, chronic pancreatitis, liver cirrhosis, chronic obstructive pulmonary disease, vitamin A deficiency	Keratitis	*Kocuria palustris*
[66]	Male	24	None	Necrotizing fasciitis	None
[67]	Male	64	Cholecystectomy	Cholangitis	None
[68]	Male	91	Intraocular lens implantation, vitrectomy	Endophthalmitis	None

Table 5: *Previous reports of infection with R. mucilaginosa in other sterile sites in the literature. a] Results from (50).*

The antibiotic susceptibility pattern of *R. mucilaginosa* has previously been described as susceptible to penicillin, ampicillin, cefotaxime, imipenem and vancomycin, and resistant to clindamycin, aminoglycosides, sulfamethoxazole/trimethoprim and ciprofloxacin [11]. However, isolates from all 65 publications showed full susceptibility to compounds of carbapenems, amphenicols, daptomycin, fosfomycin, protein synthesis inhibitors and rifampicin (Table 6).

Antibiotic group (tested antibiotics in this group)	Number of sensitive/total (% sensitive)
Penicillins (Amoxicillin-clavulanate, ampicillin, amoxicillin, carbenicillin, methicillin, nafcillin, oxacillin, piperacillin)	42/59 (71,2%)
Cephalosporins (Cefazolin, cefamandole, cefotetan, cefotaxime, ceftazidime, ceftriaxone, cephalothin, cefoxitin)	28/32 (87,5%)
Carbapenems (Ertapenem, imipenem, meropenem)	9/9 (100%)
Aminoglycosides (Amikacin, gentamicin, netilmicin, tobramycin)	28/38 (73,7%)
Amphenicols (Chloramphenicol)	9/9 (100%)
Tetracyclines (Tetracycline, tigecycline)	13/15 (87,5%)
Macrolides (Azithromycin, erythromycin)	22/24 (91,6%)
Quinolones (Ciprofloxacin, levaquin, levofloxacin, moxifloxacin, nalidixic acid, ofloxacin)	8/18 (44,4%)
Cyclic lipopeptides (Daptomycin)	3/3 (100%)
Fosfomycin	4/4 (100%)
Glycopeptides (Teicoplanin, vancomycin)	35/36 (97,2%)
Lincosamides (Clindamycin)	10/15 (66,67%)
Protein synthesis inhibitors (Fusidic acid, linezolid)	7/7 (100%)
Rifamycins (Rifampicin)	21/21 (100%)
Antifolates (Trimethoprim-sulfamethoxazole)	6/12 (50%)

Table 6: *Antibiotic susceptibilities of described isolates of R. mucilaginosa in the literature.*

Discussion

In this review, we describe the occurrence of the human oral commensal bacterium *R. mucilaginosa* in cultured samples from Rigshospitalet during a 2-year period. In addition, we also give an overview of the literature on previously described infections with this opportunistic pathogen.

Comparison of hospital data and literature review

The ability to compare hospital data with published case reports is very limited. Since the hospital data was directly extracted from the laboratory database, all findings of *R. mucilaginosa* were included. It is relevant to assume that samples with clinically relevant findings as well as findings representing either normal flora or contamination will be obtained in a hospital. This stands in great contrast to published case reports, where only findings believed to be pathogenic are reported. When extracting data from the laboratory database, it was possible to track which department had sent the sample, but not possible to establish the clinical relevance of each sample.

Based on the fact that *R. mucilaginosa* is naturally found in the oral cavity and pharynx, findings from these sites are most likely to represent normal flora. The same is believed to be the case with isolates from breast milk where *R. mucilaginosa* may be transmitted from the oral cavity of a baby during breastfeeding. Isolates from sterile sites such as blood cultures are more likely to be pathogenic but with the possibility that they could also represent contamination. The latter is believed to be the case in at least one sample isolated from the search of the hospital laboratory database; a piece of bone collected from a bone bank for routine testing. Only bone from suspected healthy individuals would be sent to a bone bank, and even though one case of spondylodiscitis has previously been reported, it seems far more likely to be contamination of the sample.

The review of the literature resulted in the description of 118 patients, of which most presented with sepsis and bacteremia. Compared to the laboratory findings from Rigshospitalet, where only 3 samples (6.5% of total) were isolated from blood cultures, it can be suggested that *R. mucilaginosa* rarely causes severe invasive infections. As noted above it was not possible to establish the clinical relevance of these samples since patient history was not obtained.

Route of infection

Since *R. mucilaginosa* has been shown as a commensal of the oral cavity, it can be suspected that spread to the blood from the oral cavity and dental caries may be a source of infection [12]. The infection types most commonly seen in the literature were bacteremia and sepsis, but several cases of meningitis and pneumonia were also reported, which might have occurred after bacterial entry from the oral cavity to the bloodstream or transfer to the airways. Another possibility is dysphagia causing translocation of bacteria from the oral cavity to the lung as well as iatrogenic spread of bacteria, for example after surgery in the oral cavity or pharynx that may lead to post-operative infections.

Infectious potential

The infectious potential of *R. mucilaginosa* can be discussed, as it is not certain how well it causes infection. *R. mucilaginosa* can be described as an opportunistic bacteria, exploiting its hosts weakened immune defense or sudden availability to the bloodstream after dental procedures. Many patients in the literature review also presented with chemotherapy-associated neutropenia, which could have contributed to the emergence of infection. 22 of the described cases were polymicrobial, which makes it difficult to establish the infectious potential of *R. mucilaginosa*. The other species found as parts of the polymicrobial infections have all been described as part of the oral bacterial community.

Treatment and antibiotic susceptibility

Isolates from all case reports with *R. mucilaginosa* showed full susceptibility to the antibiotic groups carbapenems, amphenicols, cyclic lipopeptides (daptomycin), fosfomycin, protein synthesis inhibitors and rifamycins. The susceptibility pattern of isolates in the laboratory

database resembled that of the literature. However, not all isolates were tested for antibiotic susceptibility, and isolates from the oral cavity were often not tested since the finding was attributed as part of the normal flora, and not relevant to treat.

When the presence of *R. mucilaginosa* is estimated to be significant for causing infection, we might suggest the use of either cephalosporins, carbapenems, glycopeptides or macrolides in the treatment regimen. Rifamycin can be added or used in combination with either of these drugs.

Contamination vs. infection

As explained above, patient histories were not available from the laboratory database at Rigshospitalet. One sample was received for routine testing from the bone bank, making the presence of *R. mucilaginosa* a sign of contamination. Many samples isolated at Rigshospitalet were from either the oral cavity or upper respiratory tract where *R. mucilaginosa* is likely to represent normal flora. The majority of case reports with *R. mucilaginosa* were invasive infections of normally sterile sites, or sites where *R. mucilaginosa* is not a part of the commensal bacteria. Overall we suggest that growth-positive cultures with *R. mucilaginosa* from sterile sites, or sites where it is not part of the normal flora or where natural contamination may not occur, must be considered pathogenic or clinically relevant. Correct procedure during sampling and handling is crucial in order to minimize contamination of the sample. Patient history including comorbidity and clinical presentation, as well as other relevant laboratory findings, should be considered in order to establish the likelihood of *R. mucilaginosa* as the disease-causing agent.

Conflicts of Interest

Declarations of interest: None.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Acknowledgements

The authors would like to thank Camilla Thranow and Sarah Buur Bendixen from the Department of Clinical Microbiology for assistance in searching for findings of *R. mucilaginosa* in the laboratory database at Rigshospitalet.

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