Scientific Research Publishing

Open Journal of Medical Microbiology, 2025, 15(2), 125-132
https://www.scirp.org/journal/ojmm
ISSN Online: 2165-3380
ISSN Print: 2165-3372

Nocardia cyriacigeorgica Infection in an Immunocompetent Patient: A Case Report from Italy and a Review of Recent Literature

Romano Mattei[1*], Mariapia Niceforo[2], Moreno Ferroni[1], Laura Carrozzi[2,3], Massimiliano Desideri[3]

[1]Eurofins LAMM Chemical-Clinical and Microbiological Analysis Laboratory, Lucca, Italy
[2]Department of Surgical, Medical, Molecular Pathology and Critical Area, University of Pisa, Pisa, Italy
[3]University Division of Pulmonology, Pisa University Hospital, Pisa, Italy
Email: *romanomattei1954@gmail.com

How to cite this paper: Mattei, R., Niceforo, M., Ferroni, M., Carrozzi, L. and Desideri, M. (2025) *Nocardia cyriacigeorgica* Infection in an Immunocompetent Patient: A Case Report from Italy and a Review of Recent Literature. *Open Journal of Medical Microbiology*, **15**, 125-132.
https://doi.org/10.4236/ojmm.2025.152010

Received: March 19, 2025
Accepted: June 24, 2025
Published: June 27, 2025

Abstract

Nocardiosis is prevalent among individuals with immunodeficiency or long-term use of immunosuppressive agents. However, in one third of cases, it can occur in immunocompetent patients [1]. Nocardia infections in immunocompetent patients represent a diagnostic challenge given the clinical and radiological similarity with infectious diseases and neoplasms [2]. We present the case of a *Nocardia cyriacigeorgica* pneumonia in an immunocompetent patient who had no history of immunosuppressive agent use, signs of immunodeficiency, or any concomitant diseases. In Italy, cases of *Nocardia cyriacigeorgica* infection are rarely reported in the literature, likely due to challenges in microbiological isolation and identification of this microorganism.

Keywords

Nocardia cyriacigeorgica, Nocardia Pneumonia, Immunocompetent, Italy

1. Introduction

Nocardia cyriacigeorgica is the most commonly linked to respiratory tract infections [3]-[12] but also from samples from several other sites [13]-[19]. *Nocardia cyriacigeorgica* typically causes infections in immunocompromised individuals and has been identified in clinical specimens worldwide. However, several case reports have also documented infections in immunocompetent patients [20]-[22]. Over the past year, nine cases of *Nocardia cyriacigeorgica* infection have been reported in PubMed. The cohort included seven men and two women, with six pa-

tients over the age of 50. Pulmonary nocardiosis was diagnosed in four cases, all of which occurred in immunosuppressed individuals. Regarding treatment, the majority of patients (78%) received trimethoprim-sulfamethoxazole (TMP-SMX) (see Table 1). There is no report of Nocardia species cross contaminations in human populations using immunosuppressive agents, suggesting that environmental exposure is the main cause of infection.

Table 1. Case reports of *Nocardia cyriacigeorgica* infections published in PubMed over the past year.

Autors	Country/Age/Gender	Site of infection	Treatment	The patient's immune system status
Daniel M (2024) [23]	Canada/72/F	Disseminated Infection	Trimethoprim-sulfamethoxazole, imipenem, and amikacin	Immunocomptent
Yang LN (2024) [24]	China/71/M	Endophthalmitis	Gatifloxacin ophthalmic gel	Immunocomptent
Altan G (2024) [25]	Turkey/48/F	Brain Abscess	Linezolid, amikacin, Meropenem and amphotericin B	Immunocompromised
Zuo H (2024) [26]	China/71/M	Pulmonary infection	trimethoprim-sulfamethoxazole	Immunocompromised
Koruga N (2024) [27]	Croatia/67/M	Cerebellar abscess	Ceftriaxone and trimethoprim/sulfamethoxazole	Immunocomptent
Li Q (2024) [28]	China/40/M	Pulmonary infection	Trimethoprim/sulfamethoxazole and minocycline	Immunocompromised
Li Y *et al.* (2024) [29]	China/18/M	Pulmonary infection	Trimethoprim/sulfamethoxazole and Linezolid	Immunocompromised
Calvo M (2025) [30]	Spain/60-/M	Pulmonary infection	Trimethoprim/sulfamethoxazole and Linezolid	Immunocompromised
Varda Brkić D (2025) [31]	Croatia/87/M	Disseminated Infection	Imipenem-cilastatin, amikacin, and trimethoprim-sulfamethoxazole	Immunocompromised

We present the case of a *Nocardia cyriacigeorgica* infection in an immunocompetent patient suffering from bronchiectasis and chronic obstructive pulmonary disease (COPD), who had no history of immunosuppressive agent use and signs of immunodeficiency. The isolation and identification of *Nocardia cyriacigeorgica* in routine diagnostic microbiology laboratories has been a complex and time-consuming process. However, with the advent of mass spectrometry techniques, such as matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF-MS), rapid and accurate identification has become increasingly feasible.

2. Case Report

On August 1st, 2022, a 66-year-old female outpatient presented to the Eurofins

LAMM laboratory in Lucca, located in the Tuscany region of Italy, with a diagnosis of bronchiectasis and a request for a sputum culture. Over the following days, the patient submitted two additional sputum samples, both of which confirmed the results from the initial sample.

The sputum cytology, using Papanicolaou staining, revealed a notable presence of polymorphonuclear leukocytes (**Figure 1**). The culture, grown on blood agar, showed a high bacterial count (>100,000 CFU/mL) (**Figure 2**) and microscopic examination of the colonies revealed Gram-positive beaded branching filaments. The positive samples were subsequently identified as *Nocardia cyriacigeorgica* through Matrix-Assisted Laser Desorption Ionization Time-Of-Flight (MALDI–TOF) mass spectrometry [32].

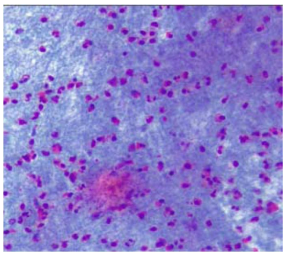

Figure 1. Microscopic examination of sputum using Papanicolaou staining.

Figure 2. The sputum culture, grown on blood agar.

Antimicrobial resistance was assessed using ETEST® (Biomerieux), which utilizes a predefined gradient of 15 antimicrobial concentrations on a plastic strip. The results are detailed in **Table 2**.

Following the laboratory diagnosis, the patient was admitted on September 15th to the Pneumology Unit at the University Hospital of Pisa, where she performed a chest CT scan that revealed multiple bilaterally peribronchiectatic consolidations and signs of mucoid infarction of the small airways in a pattern of known diffuse cylindrical and cystic bronchiectasis (**Figure 3**). Brain and abdomen MRI excluded further localizations of Nocardia. She received intravenous carbapenem (imipenem 500 mg every 6 hours with 3-hour extended infusion) and oral cotrimoxazole (3 vials in the morning + 3 vials in the afternoon + 4 vials in the evening for a total of 10 vials in a day). Therapy with cotrimoxazole was discontinued due

to the occurrence of an adverse reaction, characterised by nausea and vomiting unresponsive to antiemetics and a diffuse erythematous-papular rash on the upper and lower limbs. The patient was subsequently treated for a total of about 4 weeks with intravenous imipenem and addition an oral antibiotic of the oxazolidine family, linezolide 600 mg b.i.d., with no adverse reactions. Meanwhile, the microbiological sputum culture's results have turned negative. Upon discharge, she was prescribed an oral bactericidal antibiotic that belongs to the class of third-generation cephalosporines, cefexime 400 mg b.i.d., which she continued until May 2024 as a long-term therapy. Since then, the patient has remained free of Nocardia re-infection.

Table 2. Results of susceptibility testing for the isolated *Nocardia cyriacigeorgica* strain.

Antimicrobial agent	Isolated *Nocardia cyriacigeorgica* M.I.C in µg/mL	Interpretation CLSI M.I.C. Criteria (µg/mL) References • CLSI M100-S26, 2016 • NCCLS M24-A, 2003.		
		S	I	R
Amikacin	<1	≤8	-	≥16
Amoxicillin/Clavulanic Acid 2/1	16	≤8	16	≥32
Ceftriaxone	<4	≤8	16 - 32	≥64
Ciprofloxacin	2	≤1	2	≥4
Doxycycline	<0.12	≤1	2 - 4	≥8
Imipenem	2	≤4	8	≥16
Linezolid	<1	≤8	-	-
Minocycline	<1	≤1	2-4	≥8
Trimethoprim/Sulfamethoxazole 1/19	<0.25	≤2	-	≥4

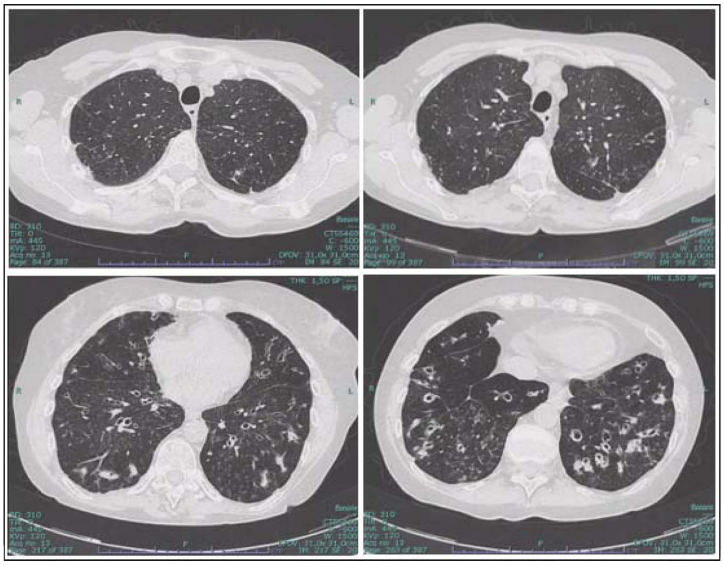

Figure 3. Chest CT scan shows infectious signs and known bronchiectasis.

3. Discussion

At times, the administration of antimicrobial treatment occurs before a precise diagnosis is made, which may result in some infections going undiagnosed. Clinicians should remain vigilant and consider the possibility of *Nocardia* infection when conventional empirical treatment fails. This approach will facilitate timely communication with microbiology laboratories to appropriately extend the culture duration, helping to prevent misdiagnosis.

Nocardia infection should be considered not only in immunocompromised patients, but also in immunocompetent hosts, especially if they have predisposing pulmonary conditions such as bronchiectasis and COPD.

When searching for "*Nocardia cyriacigeorgica*" on PubMed, out of 169 results, only three publications mention infections caused by this microorganism in Italian regions [33]-[35]. This likely indicates an underestimation of infections in these areas.

4. Conclusion

This clinical case presentation highlights how advanced laboratory techniques, such as mass spectrometry, have facilitated the identification of *Nocardia cyriacigeorgica*. Our report underlines the importance for healthcare providers to consider this microorganism as a potential cause of infection, even in immunocompetent patients, especially in those with predisposing conditions like bronchiectasis and COPD. We conclude by suggesting that *Nocardia cyriacigeorgica* may be emerging as a significant pathogen in Italy.

Informed Consent Statement

An informed consent for the publication of this case report was obtained from the patient.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] González-Jiménez, P., Méndez, R. and Latorre, A. (2022) Pulmonary Nocardiosis. A Case Report. *Revista Española de Quimioterapia*, **35**, 114-116. https://doi.org/10.37201/req/s01.24.202

[2] Garcia Rueda, J.E., García Rueda, K.Y., Bermúdez Flórez, A.M., Peña Mejía, L.A., Cardona Palacio, A. and Castaño Ruiz, W. (2024) Nocardia in an Immunocompetent Patient Simulating Pulmonary Carcinoma: A Case Report and Literature Review. *Cureus*, **16**, e64491. https://doi.org/10.7759/cureus.64491

[3] Schlaberg, R., Huard, R.C. and Della-Latta, P. (2008) *Nocardia cyriacigeorgica*, an Emerging Pathogen in the United States. *Journal of Clinical Microbiology*, **46**, 265-273. https://doi.org/10.1128/jcm.00937-07

[4] Witebsky, F.G., Conville, P.S., Wallace, R.J. and Brown-Elliott, B.A. (2008) *Nocardia*

cyriacigeorgica—An Established Rather than an Emerging Pathogen. *Journal of Clinical Microbiology*, **46**, 2469-2470. https://doi.org/10.1128/jcm.00510-08

[5] Gutiérrez, C., Céspedes, A., Legarraga, P., Morales, P. and Chanqueo, L. (2020) *Nocardia cyriacigeorgica* Infection in AIDS Patient. *Revista Chilena de Infectología*, **37**, 322-326. https://pubmed.ncbi.nlm.nih.gov/32853327/

[6] Yang, J., Ren, H., Wang, J., Dong, A., Chen, Y., Hu, D., *et al.* (2023) Clinical Characteristics, Susceptibility Profiles, and Treatment of Nocardiosis: A Multicenter Retrospective Study in 2015-2021. *International Journal of Infectious Diseases*, **130**, 136-143. https://doi.org/10.1016/j.ijid.2023.02.023

[7] Yagi, K., Ishii, M., Namkoong, H., Asami, T., Fujiwara, H., Nishimura, T., *et al.* (2014) Pulmonary Nocardiosis Caused by *Nocardia cyriacigeorgica* in Patients with *Mycobacterium aviumcomplex* Lung Disease: Two Case Reports. *BMC Infectious Diseases*, **14**, Article No. 684. https://doi.org/10.1186/s12879-014-0684-z

[8] Lin, J., Wu, X. and Peng, M. (2021) *Nocardia cyriacigeorgica* Infection in a Patient with Pulmonary Sequestration: A Case Report. *World Journal of Clinical Cases*, **9**, 2367-2372. https://doi.org/10.12998/wjcc.v9.i10.2367

[9] Wang, H., Zhu, Y., Cui, Q., Wu, W., Li, G., Chen, D., *et al.* (2022) Epidemiology and Antimicrobial Resistance Profiles of the *nocardia* Species in China, 2009 to 2021. *Microbiology Spectrum*, **10**, e01560-21. https://doi.org/10.1128/spectrum.01560-21

[10] Lima, M.R., Garcia, E., Siebeneichler, A., *et al.* (2016) Pulmonary Infection by a Negative Acid-Fast Bacilli *Nocardia Cyriacigeorgica* in a Patient with Bronchiectasis and Past (History of Tuberculosis (TB). *Chest Infections*, **149**, A106. https://journal.chestnet.org/article/S0012-3692(16)00729-7/fulltext

[11] Chavez, T.T., Fraser, S.L., Kassop, D., Bowden, L.P. and Skidmore, P.J. (2011) Disseminated *Nocardia cyriacigeorgica* Presenting as Right Lung Abscess and Skin Nodule. *Military Medicine*, **176**, 586-588. https://doi.org/10.7205/milmed-d-10-00346

[12] Browne, W.D., Lieberson, R.E. and Kabbesh, M.J. (2021) *Nocardia cyriacigeorgica* Brain and Lung Abscesses in 77-Year-Old Man with Diabetes. *Cureus*, **13**, e19373. https://doi.org/10.7759/cureus.19373

[13] Saunier, F., Grange, S., Rigaill, J., Lutz, M., Gagneux-Brunon, A. and Botelho-Nevers, E. (2022) Bacteremia and Adrenal Gland Abscess Due to Nocardia Cyriacigeorgica: A Case Report and Review. *BMC Infectious Diseases*, **22**, Article No.966. https://doi.org/10.1186/s12879-022-07839-9

[14] Khorshidi, M., Navid, S., Azadi, D., Shokri, D. and Shojaei, H. (2018) A Case Report of Brain Abscess Caused by *Nocardia cyriacigeorgica* in a Diabetic Patient. *JMM Case Reports*, **5**, 1-4. https://doi.org/10.1099/jmmcr.0.005133

[15] Lee, F.J., Aung, A.K., Pereira, L.A., Arthur, I.H. and Murray, R.J. (2013) Fatal *Nocardia cyriacigeorgica* Spontaneous Bacterial Peritonitis. *New Microbes and New Infections*, **1**, 32-33. https://doi.org/10.1002/2052-2975.18

[16] Freiberg, J.A., Saharia, K.K. and Morales, M.K. (2018) An Unusual Case of *Nocardia cyriacigeorgica* Presenting with Spinal Abscesses in a Renal Transplant Recipient and a Review of the Literature. *Transplant Infectious Disease*, **21**, e13025. https://doi.org/10.1111/tid.13025

[17] Alshammari, K., Al Hothaly, B. and Alrabiah, F. (202) Case of *Nocardia cyriacigeorgica* Infection of the Eye in a Granulomatosis with Polyangiitis Patient. *Cureus*, **12**, e11178. https://pubmed.ncbi.nlm.nih.gov/33133800/

[18] Gabay, S., Yakubovsky, M., Ben-Ami, R. and Grossman, R. (2022) *Nocardia cyriacigeorgica* Brain Abscess in a Patient on Low Dose Steroids: A Case Report and Re-

view of the Literature. *BMC Infectious Diseases*, **22**, Article No. 635. https://doi.org/10.1186/s12879-022-07612-y

[19] Lee, J., Whitby, M. and Hall, B.I. (2010) *Nocardia cyriacigeorgica* Abscess of the Conus Medullaris in an Immunocompetent Host. *Journal of Clinical Neuroscience*, **17**, 1194-1195. https://doi.org/10.1016/j.jocn.2009.12.022

[20] Rivera, K., Maldonado, J., Dones, A., Betancourt, M., Fernández, R. and Colón, M. (2017) *Nocardia cyriacigeorgica* Threatening an Immunocompetent Host: A Rare Case of Paramediastinal Abscess. *Oxford Medical Case Reports*, **2017**, 239-241. https://doi.org/10.1093/omcr/omx061

[21] Kibe, S., Meigh, R., Moon, T., Kastelik, J. and Morjaria, J. (2015) *Nocardia cyriacigeorgica* in an Immunocompetent Patient. *Therapeutic Advances in Respiratory Disease*, **9**, 28-30. https://doi.org/10.1177/1753465814565352

[22] Lv, H.Y., Chen, M.Y., Ji, Y.Q., Pan, L.Y., Hong, X. and Ge, Y.M. (2023) A Rare Case of a Subcutaneous Abscess Caused by *Nocardia cyriacigeorgica* in an Immunocompetent Patient. *Infection and Drug Resistance*, **1**6, 263-268. https://pubmed.ncbi.nlm.nih.gov/36660347/

[23] Daniel, M., Salman, S. and Adam, B. (2024) Disseminated *Nocardia cyriacigeorgica* Infection Disguised as a Metastatic Adrenal Gland Malignancy in a Healthy Patient. *Cureus*, **16**, e63693. https://pubmed.ncbi.nlm.nih.gov/38957514/ https://doi.org/10.7759/cureus.63693

[24] Yang, L.N., Wang, W., Sun, X.F., Wang, Y.L. and Sheng, Z.Y. (2024) A Case of *Nocardia cyriacigeorgica* Endophthalmitis after Intraocular Surgery. *Chinese Journal of Ophthalmology*, **60**, 931-934. https://pubmed.ncbi.nlm.nih.gov/39505380/

[25] Altan, G., Tabanli, A., Ozgenc, G. and Ece, G. (2024) Primary Brain Abscess Due to *Nocardia cyriacigeorgica* in a Patient with Renal Transplantation: Case Report. *The New Microbiologica*, **47**, 363-367. https://pubmed.ncbi.nlm.nih.gov/39998402/

[26] Zuo, H., *et al.* (2024) Myasthenia Gravis Complicated with Pulmonary Infection by *Nocardia cyriacigeorgica*: A Case Report and Literature Review. *Frontiers in Medicine* (*Lausanne*), **11**, Article 1423895. https://pubmed.ncbi.nlm.nih.gov/39416864/

[27] Koruga, N., *et al.* (2024) A Rare Case of Cerebellar Abscess Caused by *Nocardia cyriacigeorgica*. *Surgical Neurology International*, **15**, 413. https://pubmed.ncbi.nlm.nih.gov/39640338/ https://doi.org/10.25259/SNI_426_2024

[28] Li, Q., Zheng, J., Zhang, Q., Liang, Y., Zhu, H. and Sun, Y. (2024) A Case of Yellow Nail Syndrome Complicated with Pulmonary Infection Due to *Nocardia cyriacigeorgica*. *Infectious Disease Reports*, **16**, 906-913. https://doi.org/10.3390/idr16050072 https://pmc.ncbi.nlm.nih.gov/articles/PMC11417919/

[29] Li, Y., *et al.* (2024) Case Report: Pulmonary Mixed Infection by *Nocardia cyriacigeorgica*, *Stenotrophomonas maltophilia*, and Human Cytomegalovirus in a Patient with Minimal Change Nephrotic Syndrome. *Frontiers in Immunology*, **16**, Article 1599958. https://pubmed.ncbi.nlm.nih.gov/40491912/ https://doi.org/10.3389/fimmu.2025.1599958

[30] Calvo, M., Beunza Sola, M., Tirapu, B., Sarobe Carricas, M. and Moreno, E. (2025) Therapeutic Drug Monitoring of Linezolid in a Case of Pulmonary Nocardiosis: A Case Report. *European Journal of Hospital Pharmacy*. https://pubmed.ncbi.nlm.nih.gov/39978959/ https://doi.org/10.1136/ejhpharm-2024-004462

[31] Varda Brkić, D., *et al.* (2025) Disseminated Infection Caused by *Nocardia cyriacigeorgica* in Immunocompromised Patient Confirmed by Whole Genome Sequencing.

Chemotherapy, **70**, 1-8. https://doi.org/10.1159/000539977
https://pubmed.ncbi.nlm.nih.gov/39128464/

[32] AlMogbel, M., AlBolbol, M., Elkhizzi, N., AlAjlan, H., Hays, J.P. and Khan, M.A. (2020) Rapid Identification of *Nocardia cyriacigeorgica* from a Brain Abscess Patient Using MALDI-TOF-MS. *Oxford Medical Case Reports*, **2020**, 359-361. https://doi.org/10.1093/omcr/omaa088

[33] Terlizzi, V., Ballerini, T., Castaldo, A., Dolce, D., Campana, S., Taccetti, G., *et al.* (2024) Clinical Features and Outcomes of Persons with Cystic Fibrosis and Nocardia Isolation: A Systematic Review. *BMC Pulmonary Medicine*, **24**, Article No. 440. https://doi.org/10.1186/s12890-024-03217-0

[34] Colaneri, M., Lupi, M., Sachs, M., Ludovisi, S., Di Matteo, A., Pagnucco, L., Gulminetti, R., Mariani, B., Fabbiani, M. and Bruno, R. (2021) A Challenging Case of SARS-CoV-2-AIDS and Nocardiosis Coinfection from the San Matteo Covid-19 Registry (SMACORE). *New Microbiologica*, **44**, 129-134. https://pubmed.ncbi.nlm.nih.gov/34151993/

[35] Castellana, G., Grimaldi, A., Castellana, M., Farina, C. and Castellana, G. (2016) Pulmonary Nocardiosis in Chronic Obstructive Pulmonary Disease: A New Clinical Challenge. *Respiratory Medicine Case Reports*, **18**, 14-21. https://doi.org/10.1016/j.rmcr.2016.03.004