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Short report

Isolation and identification of *Rhizobium radiobacter* from UTI patients in Mosul City

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ABSTRACT

Background: Previously, Rhizobium *radiobacter;* rare gram-negative bacterium was considered a plant pathogen due to its ability to infect the roots of leguminous plants and the formation of Root nodes. However, now, it causes diseases in humans, especially in patients with weak immune systems. **Objective:** The main aim of this research paper is to record the isolation of this genus for the first time in the city of Mosul as an opportunistic pathogen, from patients with urinary tract infections, who have a urinary catheter. **Methods:** Sixty-seven clinical samples were collected from Al-Slam and Ibn Sina General Teaching Hospitals and cultured on the center of the brain heart infusion agar, conventional biochemical tests were performed on them, and then the Vitek 2 system was used to confirm their diagnosis, and tests for sensitivity to antibiotics **Results:** We obtained two bacterial isolates belonging to this genus and they have shown resistance to several antibiotics and are sensitive to antibiotics (F100, LEV 5 and NOR 30). **Conclusion:** These bacteria are opportunistic and can acquire virulent qualities and antibiotic resistance, so farmers should be sensitized because they are closer to dealing with the soil in terms of wearing gloves and when they feel unwell, not being in the field and visiting the hospital.

Introduction

Rhizobium radiobacter are gram-negative facultative anaerobes, motile peritrichously, non-spore-forming, use dead plants to live on them, are present in the soil, and play an important role in nitrogen fixation and the formation of Root nodes can consume multiple monosaccharides as the sole source of carbon [1]. the thick slim layer that it has because of its ability to consume a large amount of carbohydrates [2].

The first case of human infection with Rhizobium radiobacter was in a patient with prosthetic aortic valve endocarditis was reported in 1980[3]

Patients with Rhizobium radiobacter have chronic tiring diseases. [4,5]

Usually, infection with this bacterium causes bacteremia. [6,7]

Five species are related to the genus Rhizobium (i.e. R. radiobacter, R. vitis, R.

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rhizogenes, R. until, and R. rubi) the famous one reported as a human opportunistic pathogen is Rhizobium radiobacter [8] recently it's accepted as a new nomenclature for Agrobacter radiobacter and Agrobacter tumefaciens based on 16sr DNA analysis. [2, 9]

The most clinical sources we can investigate this pathogen from is the presence of foreign plastic devices such as (continuous ambulatory, urinary tract infections, Catheter-related bacteremia, and peritoneal dialysis peritonitis).[10]

This phytopathogenic bacterium is used in water and moist areas like hospital environments and is capable of transient and colonizing the human gastrointestinal tract. the most common types of infection peritonitis, endocarditis, meningitis, urinary tract, and pyogenic infections are much less commonly encountered. [11, 12, 13]

This study aims to isolate this rare bacterium from human UTI infections in Mosul City-Iraq for the first time.

Materials and methods

67 clinical samples were collected from urinary catheter patients lying in the Al-Salam and Ibn Sina General Teaching Hospitals in Mosul City / Iraq for the period from 1-12-2022 to 1-3-2023, all samples underwent culturing on brain heart infusion agar and gram stain and then their biochemical tests were conducted (oxidase, litmus milk, acid from glucose and maltose, Ferric ammonium citrate) and The diagnosis was confirmed using the Vitek 2 system, at the probability of (94 and 99%) the automated system with a gram-negative card, AST tests

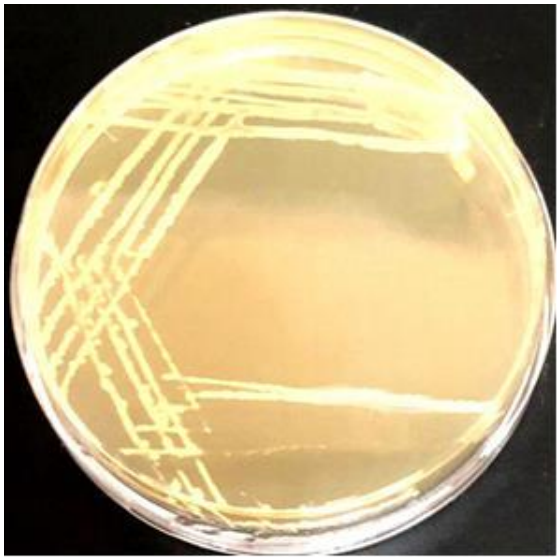
Antibiotic susceptibility tests

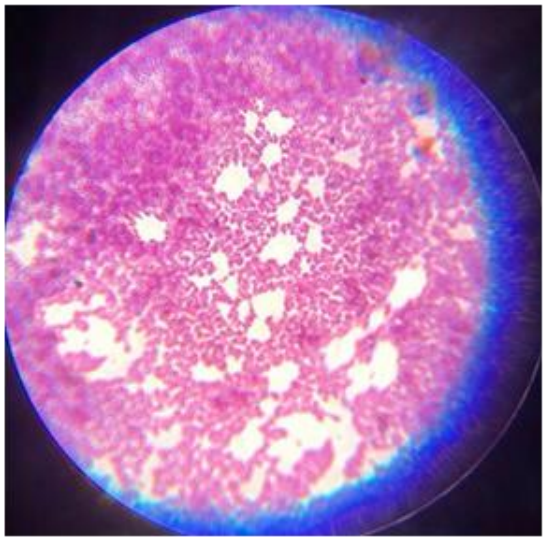
The test was carried out on Muller-Hinton Agar, following the recommendation given by CLSI depending on the Kirby-Bauer disk-diffusion method. The antibiotics used were: Ampicillin/Cloxacillin APX30, Amoxicillin AMC30, Cephalothin KF30, Ciprofloxacin CIP10, Ceftazidim CAZ30, Norfloxacin NOR30, Ceftriaxone CRO10, Aztreonam ATM30, Levofloxacin LEV5 and Nitrofurantoin F100. Zone diameters were measured by an electronic calibrator after 24h of incubation at 37˚C and were interpreted according to the CLSI recommendations. [14]

Results

We obtained 2 (2.9%) isolates out of 67 belonging to the Rhizobium radiobacter Since it was positive for biochemical tests (Oxidase, Litmus Milk, Acid from Glucose, and Maltose, Ferric ammonium citrate) and negative to gram stain fig.1.

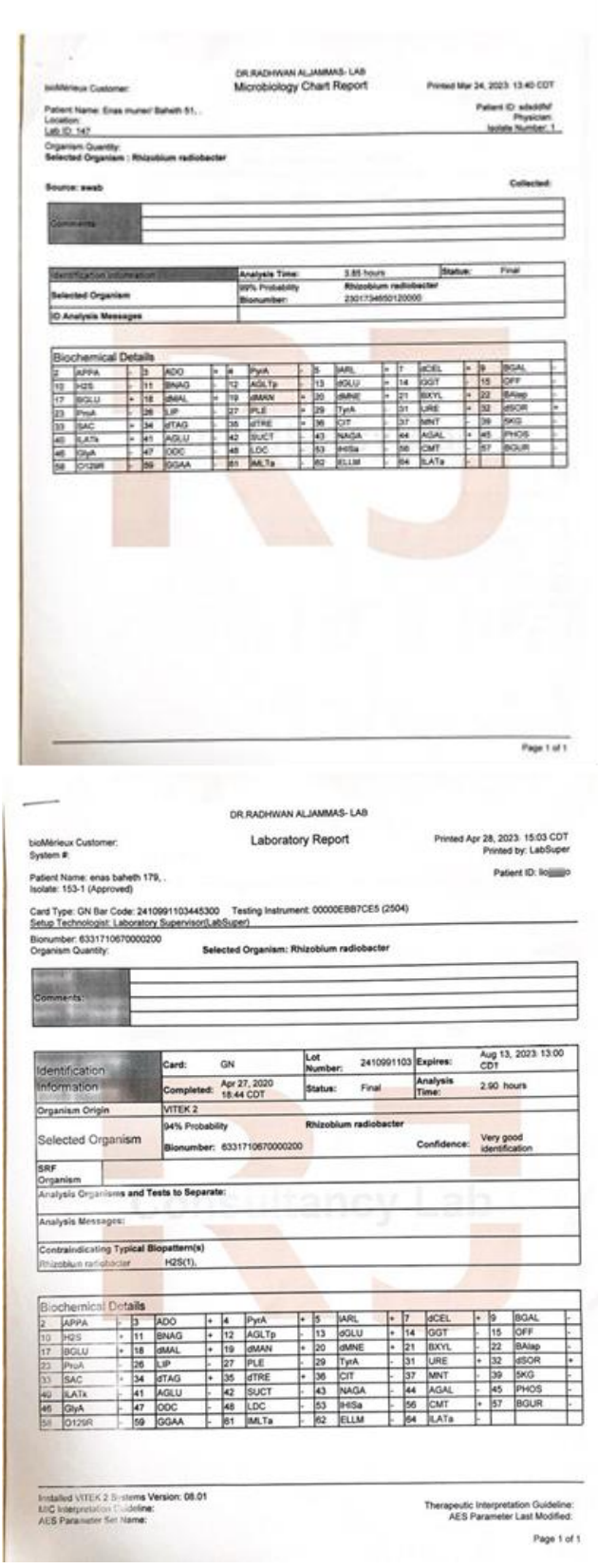
Figure 1. Up: Rhizobium radiobacter on BHIA agar, down: Gram stain showed that this bacterium was gram negative bacterium .





Then the diagnosis was confirmed using the Vitek 2 device and we got a high percentage of 94 and 99% as shown in figure 2.

Figure 2. Identification of Rhizobium radiobacter by VITEK-2 system.



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Microbiology Chart Report

Organism Quantity:
Selected Organism : Rhizobium radiobacter

Source: swab

Identification Information	Analysis Time:	3.85 hours	Status:	Final
Selected Organism	99% Probability	Rhizobium radiobacter		
	Bionumber:	2301134650120000		
ID Analysis Messages				

Biochemical Details

2	APPA	-	3	ADO	+	4	PyrA	-	5	IARL	+	7	dCEL	+	9	BGAL	-
10	H2S	-	11	BNAG	-	12	AGLTp	-	13	dGLU	+	14	GGT	-	15	OFF	-
17	BGLU	+	18	dMAL	+	19	dMAN	+	20	dMNE	+	21	BXYL	+	22	BAlap	-
23	ProA	-	26	LIP	-	27	PLE	+	29	TyrA	-	31	URE	+	32	dSOR	+
33	SAC	+	34	dTAG	+	35	dTRE	+	36	CIT	-	37	MNT	-	39	5KG	-
40	ILATk	-	41	AGLU	-	42	SUCT	-	43	NAGA	-	44	AGAL	+	45	PHOS	-
46	GlyA	-	47	ODC	-	48	LDC	-	53	IHISa	-	56	CMT	+	57	BGUR	-
58	O129R	-	59	GGAA	-	61	IMLTa	-	62	ELLM	-	64	ILATa	-			

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Laboratory Report

bioMérieux Customer:
System #:

Printed Apr 28, 2023 15:03 CDT
Printed by: LabSuper

Patient Name: enas baheth 179, .
Isolate: 153-1 (Approved)

Patient ID:

Card Type: GN Bar Code: 2410991103445300 Testing Instrument: 00000EBB7CE5 (2504)
Setup Technologist: Laboratory Supervisor(LabSuper)

Bionumber: 6331710670000200
Organism Quantity:

Selected Organism: Rhizobium radiobacter

Comments:

Identification Information	Card:	GN	Lot Number:	2410991103	Expires:	Aug 13, 2023 13:00 CDT
	Completed:	Apr 27, 2020 18:44 CDT	Status:	Final	Analysis Time:	2.90 hours
Organism Origin	VITEK 2					
Selected Organism	94% Probability	Rhizobium radiobacter			Confidence:	Very good identification
	Bionumber:	6331710670000200				
SRF Organism						
Analysis Organisms and Tests to Separate:						
Analysis Messages:						
Contraindicating Typical Biopattern(s)						
Rhizobium radiobacter	H2S(1),					

Biochemical Details

2	APPA	-	3	ADO	+	4	PyrA	+	5	IARL	+	7	dCEL	+	9	BGAL	-
10	H2S	+	11	BNAG	+	12	AGLTp	-	13	dGLU	+	14	GGT	-	15	OFF	-
17	BGLU	+	18	dMAL	+	19	dMAN	+	20	dMNE	+	21	BXYL	-	22	BAlap	-
23	ProA	-	26	LIP	-	27	PLE	-	29	TyrA	-	31	URE	+	32	dSOR	+
33	SAC	+	34	dTAG	+	35	dTRE	+	36	CIT	-	37	MNT	-	39	5KG	-
40	ILATk	-	41	AGLU	-	42	SUCT	-	43	NAGA	-	44	AGAL	-	45	PHOS	-
46	GlyA	-	47	ODC	-	48	LDC	-	53	IHISa	-	56	CMT	+	57	BGUR	-
58	O129R	-	59	GGAA	-	61	IMLTa	-	62	ELLM	-	64	ILATa	-			

Installed VITEK 2 Systems Version: 08.01
MIC Interpretation Guideline:
AES Parameter Set Name:

Therapeutic Interpretation Guideline:
AES Parameter Last Modified:

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Case reported: one from A 73-year-old farmer who suffers from urinary tract infections and undergoes dialysis every week. He also had chronic high blood pressure.

Second case was a woman 43 years old who had a urinary catheterization with surgery to remove a tumor in the colon.

The isolates showed resistant 100% to amoxicillin, cephalothin, ceftriaxone, aztreonam, ampicillin, and ceftazidime while Most strains of this bacterium are very sensitive toward levofloxacin, norfloxacin, and Nitrofurantoin As shown in table (1).

Table 1. shows the antibiotic sensitivity test against ten different antibiotics used.

NO. of isolate	AX(25)	KF(30)	CRO(10)	ATM(30)	LEV(5)	NOR(30)	F(100)	APX(30)	CAZ(30)	CIP(10)
1 isolated from 73 y old man	R	R	R	13mm	17mm	19mm	10mm	R	R	R
2 isolated from 43 y old woman	R	R	8mm	R	19mm	15mm	10mm	R	R	19mm

Discussion

Researchers Sawhney, et al. pointed to Rhizobium radiobacter when they were able to isolate them from a twenty-year-old American woman of African descent in Australia who was suffering from an Sickle Cell disease, and after the diagnosis, it turned out that she was infected with Rhizobium radiobacter that infect various places in the human body, and its members are characterized by being sensitive to several antibiotics [15].

Tiwari and Beriha isolated this bacterium from a 4-year-old child, and showed that Rhizobium radiobacter was isolated for the first time in India from a 51-year-old patient suffering from urinary tract infections and bacteremia in the blood. These bacteria cause bacteremia, abscesses in the brain, pneumonia [12,16].

Rhizobium radiobacter was also isolated from an 87-year-old woman who was admitted to the hospital emergency suffering from diarrhea, chills, and general weakness The most effective remedy for this bacterium is the third-generation of cephalosporins aminoglycosides, fluoroquinolones, and carbapenems [17].

Conclusion

As shown in these two cases this pathogen is an opportunistic pathogen It is associated with patients who carry catheters and suffer from chronic diseases, and immunocompromised patients.

Conflict of Interest

The authors declare that there is no conflict of interest

Financial Disclosures

This research has not received any funding

Data availability

All data generated or analyzed during this study are included in this puplished article.

Authors' contribution

Both authors made significant contributions to the work presented, including study design, data collection, analysis, and interpretation. They also contributed to the article's writing, revising, or critical evaluation, gave final approval for the version to be published.

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References

1- Roy S, Basuli D, Rahman EU, Adapa S, Reddy SN. Rhizobium radiobacter -induced peritonitis: A case report and literature analysis. Journal of Medical Cases. 2022 Sep;13(9):471. https://doi.org/10.14740%2Fjmc3999

2- Chen CY, Hansen KS, Hansen LK. Rhizobium radiobacter as an opportunistic pathogen in central venous catheter-associated bloodstream infection: case report and review. Journal of Hospital Infection. 2008 Mar;68(3):203-7. https://doi.org/10.1016/j.jhin.2007.11.021

3- Plotkin GR. Agrobacterium radiobacter prosthetic valve endocarditis. Annals of Internal Medicine 1980 Dec ;93(6): 840-840.

4- Alós JI, de Rafael L, Gonzalez-Palacios R., Aguiar JM, Allona A, Baquero F. Urinary tract infection probably caused by Agrobacterium radiobacter. European Journal of Clinical Microbiology 1985 4(6): 596-597.

5- Dunne Jr WM, Tillman LL, Murray JC. Recovery of a strain of Agrobacterium radiobacter with a mucoid phenotype from an immunocompromised child with bacteremia. Journal of Clinical Microbiology 1993 Sep; 31(9): 2541-2543.

6- Rodby RA, Glick EJ. Agrobacterium radiobacter peritonitis in two patients maintained on chronic peritoneal dialysis. American Journal of kidney diseases1991 Sep; 18(3): 402-405.

8- Potvliege C., Vanhuynegem L., Hansen W. Catheter infection caused by an unusual pathogen, Agrobacterium radiobacter. Journal of Clinical Microbiology 1989 27(9):2120-2122.

9- Lai CC, Teng LJ, Hsueh PR, Yuan A, Tsai KC, Tang JL, et al. Clinical and microbiological characteristics of Rhizobium radiobacter infections. Clinical infectious diseases. 2004 Jan;38(1):149-153.https://doi.org/10.1086/380463

10- Christakis GB, Alexaki P, Alivizatos AS, Chalkiopoulou I, Athanasiou AE, and Zarkadis IK. Primary bacteraemia caused by Rhizobium radiobacter in a patient with solid tumours. Journal of medical microbiology. 2006 Oct;55(10):1453-1456. https://doi.org/10.1099/jmm.0.46411-0

11- Patel W, Aboud M, Alnafisah H, Razak A. Rhizobium radiobacter sepsis in a neonate: A case report and literature review. Journal of Neonatology. 2022 Sep;36(3):240-243.

12- Tiwari S, Beriha SS. Primary bacteremia caused by Rhizobium radiobacter in neonate: A rare case report. Journal of Clinical and Diagnostic Research 2015 Oct;9(10). https://doi.org/10.7860%2FJCDR%2F2015%2F15101.6598

13- Boceska BK, Osmani D, Basovska BP, Petreska VK, Trajkova ZA, Jovanovska A et al. Rhizobium radiobacter bacteremia in a two-year-old patient with an acute lymphoblastic leukemia: A case report. Archives of Public Health. 2020 Dec 15;12(3):91-4.

14- Clinical and Laboratory Standards Institute CLSI. Performance Standards for Antimicrobial Susceptibility Testing: Twenty-Eight Informational Supplement. M100, 2021, 38(3): 186-190

15- Sawhney S., Naab T., Oneal P. Rhizobium radiobacter infection in a 27-year-old African American woman with Munchausen syndrome. Laboratory medicine 2016 April; 47(3): e32-e34. DOI: 10.1093/labmed/lmw019.

16- Mantadakis E, Kondi A, Christidou A Kalmanti M. Agrobacterium radiobacter bacteremia in a child with acute lymphoblastic leukemia. World Journal of Pediatrics. 2010 Feb; 6:181-84

17- Wang DL, Zhao LD, Li LJ, Zhou MJ. Septic shock caused by Rhizobium radiobacter in an elderly woman: A case report. Medicine 2019 Dec; 98(49), e18267.

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