5. Risco-Risco C, Masa-Calles J, López-Perea N, Echevarría JE, Rodríguez-Caravaca G. Epidemiología del sarampión en personas vacunadas, España 2003-2014. Enferm Infecc Microbiol Clin. 2017;35:569–73.
6. Mosquera M del M, de Ory F, Moreno M, Echevarría JE. Simultaneous detection of measles virus, rubella virus, and parvovirus B19 by using multiplex PCR. J Clin Microbiol. 2002;40:111–6.
7. Mosquera MM, de Ory F, Gallardo V, Cuenca L, Morales M, Sánchez-Yedra W, et al. Evaluation of diagnostic markers for measles virus infection in the context of an outbreak in Spain. J Clin Microbiol. 2005;43:5117–21.
8. Chua KYL, Thapa K, Yapa CM, Somerville LK, Chen SC, Dwyer DE, et al. What assay is optimal for the diagnosis of measles virus infection? An evaluation of the performance of a measles virus real-time reverse transcriptase PCR using the Cepheid SmartCycler(®) and antigen detection by immunofluorescence. J Clin Virol. 2015;70:46–52.
9. García Comas L, Ordobás Gavín M, Sanz Moreno JC, Ramos Blázquez B, Rodríguez Baena E, Córdoba Deorador E, et al. Community-wide measles outbreak in the Region of Madrid, Spain, 10 years after the implementation of the Elimination Plan, 2011-2012. Hum Vaccin Immunother. 2017;13:1078–83.

Juan Carlos Sanz[a,b,*], Aurora Fernández-García[b,c], Juan Emilio Echevarría[b,c], Fernando de Ory[b,c]

[a] *Laboratorio Regional de Salud Pública de la Comunidad de Madrid, Dirección General de Salud Pública, Consejería de Sanidad, Comunidad de Madrid, Madrid, Spain*
[b] *Consorcio de Investigación Biomédica de Epidemiología y Salud Pública (CIBERESP), Spain*
[c] *Laboratorio de Referencia e Investigación en Enfermedades Víricas Inmunoprevenibles, Centro Nacional de Microbiología, Instituto de Salud Carlos III, Madrid, Spain*

* Corresponding author.
E-mail address: juan.sanz@salud.madrid.org
(J.C. Sanz).

Genitourinary tract infection in children due to *Aerococcus* other than *Aerococcus viridans*. Literature review and 3 case reports☆

Infección del tracto genitourinario en el niño por Aerococcus *no* viridans. *Revisión bibliográfica y descripción de 3 casos*

The genus *Aerococcus* spp. was described for the first time in 1953. It comprises eight different species, among which *Aerococcus urinae* and *Aerococcus sanguinicola* are the primary human pathogens, being associated with underlying disease in adults.[1] However, they have been reported as rare causes of infection in the paediatric population. We report clinical and microbiological characteristics corresponding to three cases.

Case 1

A 10-year-old boy visited the emergency department owing to a fever of 40 °C lasting 24 h associated with abdominal pain. Notably, he was found to have pain on palpation of his right flank, with painful fist percussion.

He had a history of admission when he was 25 days old due to a suspected febrile urinary tract infection (UTI), not confirmed microbiologically. A renal ultrasound revealed bilateral pyelocaliceal dilation. At 7 years of age, he was diagnosed with acute appendicitis. In the postoperative period, he was readmitted owing to fever and elevated acute-phase reactants, with normal urinalysis results. He was treated with piperacillin/tazobactam and responded favourably.

A urinalysis showed leukocyturia. A urine culture and blood testing revealed 14,259 leukocytes/mm^3 and C-reactive protein (CRP) 22.6 mg/l. The boy was diagnosed with pyelonephritis and a decision was made to treat him with cefixime for 7 days. A renal ultrasound showed pyelocaliceal dilatation, distally tortuous right ureter and urinary retention.

Case 2

A 5-year-old boy had erythema of the urinary meatus and whitish urethral discharge, with the rest of the examination being normal. A sample of the discharge was taken for culture and treatment was started with a topical corticosteroid. He was seen by his paediatrician 21 days later due to persistent urethral discharge, with no fever. He was prescribed topical mupirocin for a week, and his symptoms remitted.

Case 3

An 8-year-old boy had colicky abdominal pain for 2 days and diarrhoeic stools. A urinalysis revealed microhaematuria, and a mid-stream urine culture was performed. He was prescribed fosfomycin tromethamine for 2 days, and his signs and symptoms disappeared. A subsequent renal ultrasound was normal.

Microbiology study

Using previously described procedures,[1,2] the urine cultures performed showed >100,000 colony-forming units (CFUs)/mL and >10,000 CFUs/mL of *A. urinae* for case 1 and *A. sanguinicola* for case 3. Abundant colonies of *A. urinae* alone grew in the urethral discharge culture. For the urine cultures, sensitivity to cefotaxime, ciprofloxacin, nitrofurantoin, penicillin and vancomycin was studied. For the urethral discharge culture, sensitivity to ampicillin, levofloxacin, linezolid, meropenem, rifampicin, tetracycline and vancomycin was studied. The micro-organisms were sensitive to all the antibiotics assessed.

Conclusions

Genitourinary tract sample culture enables identification of unusual micro-organisms that may present in patients with risk factors. Two of these micro-organisms, which were recently described, are *A. urinae* and *A. sanguinicola*. Infection with these micro-organisms has been widely reported as a cause of potentially serious diseases (pyelonephritis, bacteraemia, endocarditis, peritonitis, etc.) in elderly patients with urinary tract infections, immune disease or systemic disease.[1] In a review conducted in PubMed (7/2/2020), we found just 8 cases in patients 0–18 years of age (Table 1).[3–10] Among them, 6 cases featured the notable finding of extremely foul-smelling urine and two presented endocarditis. Another corresponded to a case of pyelonephritis in a patient with vesicoureteral reflux who presented abdominal pain and fever.[8] A case of bacteraemia in a 14-year-old patient with leukaemia was also reported.[9] Patients were mostly adolescent or pre-adolescent males and generally received a late diagnosis. Case 2 in our series

☆ Please cite this article as: Gutiérrez-Fernández J, Gámiz-Gámiz A, Navarro-Marí JM, Santos-Pérez JL. Infección del tracto genitourinario en el niño por *Aerococcus* no *viridans*. Revisión bibliográfica y descripción de 3 casos. Enferm Infecc Microbiol Clin. 2021;39:156–158.

Table 1
Infections caused by non-*viridans Aerococcus* in paediatric patients published in PubMed up to 7/2/2020 and 3 cases reported in our article.

Case	Age	Sex	Clinical presentation	Personal history	Urine testing	Blood testing	Diagnosis	Sample	Concomitant microbiota	Treatment	References
1	11 years	Male	Prolonged fever	Interventricular communication	Normal	Leukocytes 14,800/mm^3, CRP 156 mg/l	Endocarditis	Blood		Ceftriaxone plus vancomycin	Sous et al.[3]
			Foul-smelling urine	Imperforate anus			Mycotic pulmonary aneurysm			Pulmonary lobectomy	
										Penicillin G for 6 weeks	
2	17 years	Male	Fever, headache, tiredness, foul-smelling urine	Obesity	LE traces	Leukocytes 9900/mm^3, CRP 125 mg/l	Bacterial endocarditis	Urine		Nitrofurantoin for 7 days	Qureshi and Patel[4]
				Bicuspid aortic valve	N negative					Ampicillin plus gentamicin for 3 days	
					E 2+					Penicillin plus gentamicin for 3 weeks	
					Leukocytes 11–22					Penicillin for 3 weeks	
3	5 years	Male	Foul-smelling urine	Bladder diverticulum	50-70 leukocytes/field		Cystitis	Urine		Amoxicillin/clavulanic acid for 10 days	Skalidis et al.[5]
4	12 years	Male	Foul-smelling urine		187–275 leukocytes		Cystitis	Urine	*Corynebacterium, Actinomices neuii, Veillonella, Bacteroides fragilis*	Amoxicillin/clavulanic acid for 10 days	Lenherr et al.[6]
5	11 years	Male	Foul-smelling urine			Normal	Cystitis	Urine		Penicillin	Gibb and Sivaraman[7]
6	7 years	Male	Foul-smelling urine		LE and N negative		Cystitis	Urine		Trimethoprim/sulfamethoxazole	De Vries and Brandenburg[8]
7	12 years	Male	Fever (39.5 °C), pain in RF, vomiting and diarrhoea	Bilateral JGO	LE 4+	Leukocytes 15,300/mm^3	Pyelonephritis	Urine		Ampicillin/sulbactam for 2 days	Murray et al.[9]
				Grade 4 left VUR	N negative	Erythrocyte sedimentation rate (ESR) 34 mm/h				Cefazolin for 5 days	
				Pyeloplasty	E 4+					Cefalexin for 7 days	
8	14 years	Male	Fever 38.1 °C	Acute myeloid leukaemia Leukopenia		Leukocytes 800/mm^3 CRP 96 mg/l	Bacteraemia	Blood		Ceftriaxone	Colakoglu et al.[10]
9	10 years	Male	Fever 40 °C, pain in RF	Recurrent UTI	LE 2+	Leukocytes 14,590/mm^3	Pyelonephritis	Urine		Cefixime for 7 days	Our case
					N negative	CRP 22.6 mg/l					
10	5 years	Male	Erythema and urinary meatus discharge				Balanitis	Urethral discharge		Topical mupirocin for 7 days	Our case
11	8 years	Male	Abdominal pain, dysuria, diarrhoea		E 2+		Cystitis	Urine		Fosfomycin tromethamine	Our case

CRP: C-reactive protein; E: erythrocytes; JGO: juxtaglomerular obstruction; LE: leukocyte esterase; N: nitrites; RF: right flank; VUR: vesicoureteral reflux.

is notable for being the first reported case of balanitis caused by *A. urinae*.

These micro-organisms are difficult to identify by conventional methods since they are easily mistaken for *Enterococcus* or *Streptococcus viridans*, *Abiotrophia defectiva*, *Lactococcus*, *Leuconostoc*, or *Pediococcus*. Furthermore, urine cultures often yield false negatives since these are slow-growing, nutritionally demanding, facultative anaerobic bacteria that usually grow with CO_2. Proper identification requires an experienced microbiologist.[1,2] At present, MALDI-TOF mass spectrometry is being used to help identify these pathogens.

In conclusion, *A. urinae* and *A. sanguinicola* are uncommon, difficult-to-identify micro-organisms that cause genitourinary infections in paediatric patients and are probably underdiagnosed. Studying their epidemiology, signs and association with underlying disease in the paediatric population will enable the relationship to the prognosis to be established and suitable treatments to be selected.

References

1. Jiménez-Guerra G, Lara-Oya A, Martínez-Egea I, Navarro-Marí J, Gutiérrez-Fernández J. Urinary tract infection by *Aerococcus sanguinicola*. An emerging opportunistic pathogen. Rev Clin Esp. 2018;218:351–5.
2. Goméz-Luque JM, Foronda-García-Hidalgo C, Gutiérrez-Fernández J. Balanopostitis por *Facklamia hominis* en Pediatría. Rev Esp Quimioter. 2019;32:278–80.
3. Sous N, Piwoz J, Baer A, Bhavsar S. Subacute *Aerococcus urinae* infective endocarditis with mycotic aneurysms in a pediatric patient: case report and literature review. J Ped Infect Dis. 2019;8:492–4.
4. Qureshi N, Patel E. *Aerococcus urinae* as the causative agent in infective endocarditis of the aortic valve in a pediatric patient. Ped Infect Dis J. 2018;37:1065–6.
5. Skalidis T, Papaparaskevas J, Konstantinou D, Kapolou E, Falagas M, Legakis N. *Aerococcus urinae*, a cause of cystitis with malodorous urine in a child: clinical and microbiological challenges. JMM Case Rep. 2017;4:e005083, http://dx.doi.org/10.1099/jmmcr.0.005083.
6. Lenherr N, Berndt A, Ritz N, Rudin C. *Aerococcus urinae*: a possible reason for malodorous urine in otherwise healthy children. Eur J Ped. 2014;173:1115–7.
7. Gibb A, Sivaraman B. A second case of foul smelling urine in a boy caused by *Aerococcus urinae*. Ped Infect Dis J. 2013;32:1300–1.
8. De Vries T, Brandenburg A. Foul smelling urine in a 7-year-old boy caused by *Aerococcus urinae*. Ped Infect Dis J. 2012;31:1316–7.
9. Murray T, Muldrew K, Finkelstein R, Hampton L, Edberg S, Cappello M. Acute pyelonephritis caused by *Aerococcus urinae* in a 12-year-old boy. Ped Infect Dis J. 2008;27:760–2.
10. Colakoglu S, Turunc T, Taskoparan M, Aliskan H, Kizilkilic E, Demiroglu Y, et al. Three cases of serious infection caused by *Aerococcus urinae*: a patient with spontaneous bacterial peritonitis and two patients with bacteremia. Infection. 2008;36:288–90.

José Gutiérrez-Fernández[a,b], Antonio Gámiz-Gámiz[c,*], José María Navarro-Marí[a], Juan Luis Santos-Pérez[c]

[a] *Laboratorio de Microbiología, Hospital Virgen de las Nieves-IBS, Granada, Spain*
[b] *Departamento de Microbiología, Facultad de Medicina, Universidad de Granada-IBS, Granada, Spain*
[c] *Unidad de Gestión Clínica de Pediatría y Cirugía Pediátrica, Hospital Virgen de las Nieves-IBS, Granada, Spain*

* Corresponding author.
E-mail address: antoniogamiz46@hotmail.com
(A. Gámiz-Gámiz).

Molecular characterization of four Group A *Streptococcus* causing invasive infection in a short time

Caracterización molecular de cuatro estreptococos del grupo A que causan infección invasiva en un corto periodo de tiempo

Group A *Streptococcus* [GAS] is a community-acquired pathogen causing non-invasive and invasive infections, which are a major cause of morbidity and mortality worldwide.[1] Healthcare-associated infections due to GAS and nosocomial transmission have been well described.[2–4]

Currently the most widely used method for GAS typing is 5′ *emm* gene sequencing which encodes the hypervariable region of the M protein, a major virulence determinant of GAS.[5] At least 200 *emm* types have been defined (https://www.cdc.gov/streplab/groupa-strep/index.html) being *emm*1 and *emm*89 the most frequently associated with severe infections in Europe.[6] Several streptococcal pyrogenic exotoxins (Spe) are implicated in the aggressiveness of GAS diseases. *Spe* genes (*speA*, *speB*, *speC*, *speF*, *speG*, *speH, speJ*, *speK*, *ssa* and *smeZ*) encode a group of mitogenic proteins secreted by many GAS strains, most of them showing very potent superantigen activity. Toxin-gene profiling is commonly used for GAS characterization.[7]

We report four invasive GAS infection cases in the Hospital Universitari Arnau de Vilanova (Lleida, Spain) in a short time: Patient A was a 65-year-old woman who required ICU admission on April 13, 2019 with septic shock; Patient B was a 67-year-old woman admitted in the ICU on April 26, 2019 with septic shock and pneumonia; Patient C was a 40-year-old immunosuppressed man who were admitted to the Emergency setting on April 28, 2019 with fever; Patient D was a 82-year-old woman admitted to the Emergency setting on May 28, 2019 with fever and surgical wound infection.

Three strains were isolated from blood samples (strains A, C and D) and one from bronchoalveolar lavage (BAL) (strain B).

GAS antibiotic susceptibility testing was performed with Panel Type 33 of Microscan WalkAway microdilution system using the breakpoints recommended by The European Committee on Antimicrobial Susceptibility Testing.[8]

Because the four invasive GAS cases [three bacteremias (patient A, patient C and patient D) and one pneumonia (patient B)] occurred so closely in time, the isolates were sent to the Centro Nacional de Microbiología, Instituto de Salud Carlos III for M protein gene (*emm*) typing and toxin-gene profiling as previously described.[7]

The four GAS strains were susceptible to penicillin, clindamycin, erythromycin, tetracycline and vancomycine. Toxin-gene profiles and *emm* typing of the four GAS strains are shown in Table 1.

All strains harbored the 3 superantigenic toxin genes: *speB*, *speF* and *speG* regardless of *emm* type. GAS strains with the same *emm* type have shown the same toxin profile (Table 1) coinciding with that described by Bencardino D et al.[9]

An identical clone *emm*1 was isolated from two of the patients (A and B) coinciding in time in ICU setting (April 26–29, 2019). Strain A was recovered from blood sample obtained in the Emergency Service previously ICU admission. Strain B was isolated from a BAL obtained upon ICU admission. Both patients developed a serious invasive infection with multiorgan failure and were treated with penicillin and clindamycin after GAS isolation. Patient A was

Table 1
Toxin-gene profiling and *emm* type of the four invasive GAS strains isolated.

Strain	*emm* type	*speA*	*speB*	*speC*	*speF*	*speG*	*speH*	*speJ*	*ssa*	*smeZ*
A	1	+	+	–	+	+	–	+	–	+
B	1	+	+	–	+	+	–	+	–	+
C	89	–	+	+	+	+	–	–	–	–
D	89	–	+	+	+	+	–	–	–	–

Note. +: present; –: absent.