JOURNAL OF PURE AND APPLIED MICROBIOLOGY, March 2013. Vol. **7**(1), p. 229-233

Antibiotic Susceptibility of Motile *Aeromonas* spp. Isolated from Saricay Stream (Canakkale, Turkey)

N. Hacioglu[1]*and B. Dulger[1,2]

[1]Department of Biology, Faculty of Science & Arts, Canakkale Onsekiz Mart University, Canakkale, Turkey.
[2]Department of Biology, Faculty of Science & Arts, Duzce University, Duzce, Turkey.

(Received: 14 June 2012; accepted: 08 August 2012)

This study was carried out for the determination of the physico-chemical and microbiological quality and antibiogram profiles of the *Aeromonas* spp. isolated from Saricay stream in Canakkale –Turkey. The results indicated that water from this stream were of poor microbiological quality and unfit for human consumption. A total of 13 *Aeromonas* species were isolated from sixty (21.66%) water samples. This strains were identified as *Aeromonas caviae* (53.84%), *A. hydrophila* (23.07%), *A. veronii* bv. *sobria* (23.07%). All aeromonads (100%) strains were resistant to erythromycin, amoxycillin, ampicillin (except one *A.hydrophila* strain), but susceptible to gentamicin.

Key words: Saricay stream, Water quality, Motile *Aeromonas* spp., Antibiotic susceptibility.

Motile *Aeromonas* spp. (*A. hydrophila*, *A. veronii* bv. *sobria* and *A. caviae*) are now recognized as causative agents of various infections in humans and animals, the main types of which are gastroenteritis, soft tissue infections and systemic infection. Over the last decades, these organisms have also emerged as oppurtunistic pathogens responsible for gastroenteritis, skin and tissue infections, persistent dysentery and a variety of clinical syndromes in children, elderly people and compromised children, elderly people and patients. Antibiotic resistant bacteria and antibiotics are discharged in various amounts in the environment as a result of the increasing and often indiscriminate use of antibiotics in medical, veterinary and agricultural practices. Contamination of water sources by directly or indirectly with *Aeromonas* spp. may cause disease and even antibiotic resistance carrying on the genes. Antibiotic sensivity of clinical isolates of *Aeromonas* spp. has been extensively studied, but less is known about environmental strains[1].

The primary aim of this study was to determine the microbial quality (total and faecal coliform counts) and some physico-chemical parameters of the water in the Saricay stream. However, the present study reports the antibiotic susceptibility patterns of motile *Aeromonas* spp. isolated from different sites of Saricay stream (Canakkale, Turkey), in order to evaluate the level of antibacterial resistance in waters sampled from the stream.

MATERIALS AND METHODS

The Saricay stream is located in the southwest region of Marmara, latitude 39°40' – 40°45' N and longuitude 25°37' – 27°45' E, in Canakkale, Turkey [2]. Sampling for water quality parameters were carried out in the five study sites

* To whom all correspondence should be addressed.
E-mail: nurcihan.n@gmail.com

at monthly intervals between January–December 2010. Physico- chemical parameters of Saricay stream were measured by a portable multiparametric probe (Hatch–Lange trademark ecological kit).

Microbiological quality parameters (total count (TC), faecal coliforms (FC) and identification of motile *Aeromonas* spp.) were performed according to standard methods[3 - 4]. The antibiotic susceptibility test was performed by standard disc diffusion method[5]. Antibiotics used in this study shown in Table 3. Organisms were reported as either resistant, intermediate or sensitive to each antimicrobial tested.

The values were computed, analysed and presented as mean±standard deviation. Pearson's correlation coefficient (r) was used to show correlation between the all data using the MINITAB Statistical Software 13.20. The Student's t-test was also used to determine the statistical significance. Probability was set at $P<0.05$.

RESULTS AND DISCUSSION

Table 1 shows the values of arithmetic mean and Table 2, indicate the correlation coefficents of various parameters represented in Saricay Stream. And percentage frequency of antibiotic susceptibility profiles of isolated *Aeromonas* spp. were given in Table 3.

In the study 13 *Aeromonas* species were isolated from sixty (21.66%) water samples. This strains were identified as *Aeromonas caviae* (53.84%), *A. hydrophila* (23.07%), *A. veronii* bv. *sobria* (23.07%). In some publications, *A. hydrophila* was the most common species[6-8]. However in this study shown the similar result of other investigators [1,9]. So *A. caviae* was the most common species and rare *A. hydrophila*, *A. veronii* bv. *sobria* in water samples.

All aeromonads (100%) strains were resistant to erythromycin, amoxycillin, ampicillin (except one *A.hydrophila* strain). Additionally all *A. hydrophila, A. caviae* strains were found resistant to cephalothin. Gentamicin showed excellent activity the aeromonads tested in the present study. All *A. hydrophila* strains were susceptible against furazolidone, chloramphenicol, trimethoprim, oxytetracycline, cefmetazole, tobramycin. *A. veronii* bv. *sobria* also were sensitive against chloramphenicol. The other

Table 1. Values of physicochemical and microbiological parameters (Mean±SD) Saricay Stream

Parameter	Site					
	I	II	III	IV	V	Average
Temperature (°C)	17.49±5.39	17.22±6.01	17.12±4.78	17.00±4.61	17.90±5.47	17.35±0.29
DO (mg/l)	6.53±2.69	7.32 ±2.27	8.51±2.95	7.45±2.00	10.98±1.93	8.16±2.30
BOD_5 (mg/l)	7.29±1.77	7.14 ±2.13	13.72±7.67	13.14±4.34	13.23±5.93	10.90±3.37
pH	7.78 ±0.28	7.38±0.07	7.76 ±0.25	7.83 ± 0.28	7.96 ± 0.28	7.74±0.12
E.C. (µS/cm)	236.74±554.34	171.59±228.26	97.99±167.11	866.34±632.22	747.66±222.42	424.06±355.48
TC (MPN/100 ml)	20983.33±31072.9	20691.67±29395.3	26600±40830.3	65400±48724.0	17583.33±19149.6	30251.67±19915.6
FC (MPN /100 ml)	14150±31435.5	17491.67±30148.8	18850±30140.2	22633.33±41283.6	28650 ±49060.38	20355±31111.8

Table 2. Correlation coefficients of the parameters in the Saricay stream

Parameter	Temperature	DO	BOD_5	pH	EC	TC	FC
Temperature	1	0.650	- 0.029	0.440	0.212	- 0.643	0.461
		0.235	0.964	0.458	0.733	0.242	0.434
DO		1	0.644	0.536	0.409	- 0.281	0.882*
			0.241	0.352	0.495	0.647	0.048
BOD_5			1	0.681	0.511	0.403	0.713
				0.205	0.379	0.501	0.176
pH				1	0.603	0.194	0.576
					0.282	0.755	0.309
EC					1	0.593	0.770
						0.292	0.128
TC						1	0.148
							0.812
FC							1

* Correlation is significant at the 0.05 level
DO: Dissolved oxygen; BOD: Biochemical oxygen demand.; EC: Electrical Conductivity

Table 3. Percentage frequency of antibiotic resistant *Aeromonas* strains

Class of antibiotics	Antibiotic	A.hydrophila number (percent)			A.caviae			A. veronii bv. sobria		
		R	I	S	R	I	S	R	I	S
Macrolide	Erythromycin	3 (100)	0 (0)	0 (0)	7 (100)	0 (0)	0 (0)	3 (100)	0 (0)	0 (0)
Nitrofurantoin	Furazolidone	0 (0)	0 (0)	3 (100)	3 (42.85)	3 (42.85)	1 (14.28)	1 (33.33)	1 (33.33)	1 (33.33)
Phenicols	Chloramphenicol	0 (0)	0 (0)	3 (100)	1 (14.28)	1 (14.28)	5 (71.42)	0 (0)	0 (0)	3 (100)
Sulphonamide	Trimethoprim	0 (0)	0 (0)	3 (100)	5 (71.42)	0 (0)	2 (28.57)	2 (66.66)	0 (0)	1 (33.33)
B- lactam	Amoxycillin	2 (66.67)	0 (0)	1 (33.33)	7 (100)	0 (0)	0 (0)	3 (100)	0 (0)	0 (0)
	Ampicillin	2 (66.67)	0 (0)	1 (33.33)	7 (100)	0 (0)	0 (0)	3 (100)	0 (0)	0 (0)
Tetracycline	Oxytetracycline	0 (0)	0 (0)	3 (100)	5 (71.42)	1 (14.28)	1 (14.28)	1 (33.33)	0 (0)	2 (66.66)
Cephalosporins	Cephalothin	3 (100)	0 (0)	0 (0)	7 (100)	0 (0)	0 (0)	1 (33.33)	2 (66.66)	0 (0)
	Cefmetazole	0 (0)	0 (0)	3 (100)	5 (71.42)	1 (14.28)	1 (14.28)	2 (66.66)	1 (33.33)	0 (0)
	Cefoxitin	1 (33.33)	1 (33.33)	1 (33.33)	4 (57.14)	1 (14.28)	2 (28.57)	2 (66.66)	1 (33.33)	0 (0)
	Cefotaxime	0 (0)	1 (33.33)	2 (66.67)	0 (0)	3 (42.85)	4 (57.14)	0 (0)	2 (66.66)	1 (33.33)
Aminogly-cosides	Tobramycin	0 (0)	0 (0)	3 (100)	2 (28.57)	0 (0)	5 (71.42)	0 (0)	1 (33.33)	2 (66.66)
	Kanamycin	1 (33.33)	1 (33.33)	1 (33.33)	2 (28.57)	3 (42.85)	2 (28.57)	0 (0)	3 (100)	0 (0)
	Gentamicin	0 (0)	0 (0)	3 (100)	0 (0)	0 (0)	7 (100)	0 (0)	0 (0)	3 (100)

R:Resistant ; I:Intermediate; S: Sensitive

antibiotics showed variable inhibitory activity against the various aeromonads. However in this study indicate that multiple antibiotic resistance (MAR), particularly erythromycin, amoxycillin, ampicillin, is often seen in *Aeromonas* spp.

DISCUSSION

Correlatively based on results of comparison of data with Water Pollution Control Regulation (WPCR), it is seen that waters of Saricay stream at the sites 1-5 belonged to Class 1, for all physicochemical parameters parameters (except electrical conductivity). Electrical conductivity (EC) is the most important parameters used to assess the quality of water regarding inorganic matter. The mean of EC is seen in Table 1. So waters of Saricay Stream at the sites 1-5 belonged to Class 3 for EC.

The abundance of these indicators (TC and FC) is supposed to be correlated to the density of pathogenic microorganisms from faecal origin and is thus an indication of the sanitary risk associated with the various water utilizations. Based on results of comparison of data with WPCR, it is seen that waters of Saricay Stream for TC and FC at the sites 1-5 belonged to Class 4. Results which were found in the present investigation had shown some differently from previous study [2]. Because of remarkable increasing of FC rates, can be said that the entrance of human and animal faecal waste. The bacteriological quality of the Saricay Stream posed an increased risk of infectious disease transmission to the communities that were dependent on the stream.

Yearly averages indicate a slight increasing trend at all the sites. But DO showed significant positive correlation with FC which is indicated by asterisk in Table 2.

Results of this study about antimicrobial resistant of *Aeromonas* spp., are similar reported by Altanlar et al. [6] who found 66 *Aeromonas* strains were resistant to ampicillin and erythromycin and susceptible to ciprofloxacin, cefazolin, cefixime, trimethoprime and sulphamethoxazole and gentamicin. There are similar results in the other investigators observartions about antibacterial activity of macrolides, tetracycline, nitrofurantoins, aminoglycosides, cephalosporins, phenicols, sulphonamide, B- lactams [3,11,12].

In conclusions the results presented here show a detailed pattern of sensivity of the various *Aeromonas* isolates to a variety of antibiotics and provide useful information in the context of selective isolation and phenoptypic identification of the aeromonads. The development of drug resistance in environmental *Aeromonas* spp. is of clinical concern, both because this is most probably the consequence of the increasing and often indiscriminate use of antibiotics, and because these organisms may cause human infections [1]. Based on our investigations it is suggested that many antibiotic groups such as aminoglycosides, tetracycline, sulphonamide, phenicols, nitrofurantoins could be effectively used to control the aeromonads.

ACKNOWLEDGMENTS

The authors thank to Research Fund of Canakkale Onsekiz Mart University, Canakkale, Turkey (Project number: 2010-36) for the financial support.

REFERENCES

1. Urriza, M.G., Pineau, L., Capdepuy, M., Roques, C., Caumette, P. and Quentin, C. Antimicrobial resistance of mesophilic *Aeromonas* sp. isolated from two european rivers. *Jl Antimicrob Chemother*. 2000; **46**: 297–301,.
2. Hacioglu, N. and Dulger, B. Montly variation of some physico-chemical and microbiological parameters in Saricay steam (Canakkale, Turkey), *FEB*. 2010; **19**(5a): 986–990,.
3. APHA: (American Public Health Association). Standard Methods for the Examination of Water and Waste water, 19th Ed., Washington, 1992; pp 150 – 154.
4. Popoff, M. Genus 3 *Aeromonas*. In, Krieg NR, Holt JG (Eds): Bergey's Manual of Systematic Bacteriology. 9th ed., Williams and Wilkins, Baltimore, 1984; pp 545–548.
5. NCCLS: (National Committee for Clinical Laboratory Standards). Performance standards for antimicrobial disk susceptibility tests; Approved Standard, 8 ed. NCCLS Document M2-A7. Wayne, 2009.
6. Altanlar, N. Yücel, N. and Akýn, A. Occurence and antibiotic susceptibility of motile *Aeromonas* spp. on untreated well water. *J Fac Pharm*. 2003; **32**(3): 151–157.

7. Durmaz, Y. and Turk, N. Isolation of Motil *Aeromonases* and to determine antimicrobial susceptibility from farms of Trout. *Kafkas Univ Vet Fak Derg*. 2009; **15**(3): 357-361.
8. Korun, J. and Toprak, H.B. Kültürü yapýlan gökkuþaðý alabalýklarý (*Oncorhynchus mykiss*)'nýn barsaðýndan izole edilen hareketli *Aeromonas* suþlarýnýn antibiyotik hassasiyetleri üzerine NaCl'ün etkisi. *Kafkas Univ Vet Fak Derg*. 2010; **16**(2): 193-198.
9. Awan, M.B., Maqbool, A., Bari, A. and Krovacek, K. Antibiotic susceptibility profile of *Aeromonas* spp. isolates from food in Abu Dhabi, United Arab Emirates. *New Microbiol*. 2009; **32**: 17-23.
10. Scoaris, D.O., Volacite, J., Nakamura, C.V., Nakamura, T.U., Filho, B.A. and Filho, B.P.D. Virulence and antibiotic susceptibility of *Aeromonas* spp. isolated from drinking water. *Antonie van Leeuwenhoek*. 2008, **93**: 111–122.