

SUPSI

Role of *Aeromonas spp.* in the environmental spread of resistance genes

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Introduction and Aim

The aquatic environment is a natural ecosystem that act as a reservoir, but also as a medium for the spread of resistance genes and their vectors (1). Since *Aeromonas* are natural inhabitant of water environments and some species are pathogenic for both humans and animals, they could be well placed to play a role in the dissemination of resistant genetic determinants (2). To be transferred, resistance genes, have to be located on mobile DNA elements such as plasmids, integrons and transposons. Class I integrons and Tn21 transposons subfamily are often carried on broad-host-range conjugative plasmids and are the most common genetic element involved in the global dissemination of antibiotic resistance determinants among bacteria (3,4).

The aim of this work was to evaluate the role of these genetic elements in the dissemination of antibiotic resistance determinants among *Aeromonas spp.* and potentially pathogen bacteria, in different aquatic environment.

Material and methods

231 *Aeromonas spp.* and 250 Fecal Coliforms with different resistance and plasmidic Coliforms were previously isolated from various aquatic environments (hospital wastewater, wastewater treatment plant, waters from a river upstream and downstream the outlet of the WWTP and from an alpine lake). The presence of Class I integrons and of Tn21 transposon subfamily was investigated by PCR (*pant-qacΔE* region and *tnpA* gene respectively) and by Dot blot analysis. Gene cassettes were sequenced. Plasmid location of integrons and transposons was established by Southern blot hybridization. Plasmid mobility was determined by blotting of mobilizable groups (MOBs) and by horizontal gene transfer experiments. Transformation was made using competent *Acinetobacter baylyi* BD413 strain as the recipient.

Conclusions

Our study showed that all the *tnpA* genes and most of the *intI* genes found in Fecal Coliforms isolated from aquatic environments were located on plasmids. In a lesser extent, a similar situation was found for *Aeromonas spp.* of the same origins. In fact, *Aeromonas* strains can carry *tn21* and *tn21*-like transposons as well as class I integrons on transferable or mobilizable plasmids. Moreover, *Aeromonas* 101DG-Aer was able to transform a natural competent *Acinetobacter baylyi*. These results suggest that *Aeromonas* can contribute to the environmental spread of antibiotic resistance determinants among bacteria not only through conjugation but also through transformation.

Outlook

To improve our knowledge on the role played by *Aeromonas spp.* in the environment diffusion of resistant determinant genes, we are planning to extend our studies on the importance of transduction and of transformation using the strains we isolated from aquatic environments.

Results and discussion

Aeromonas strains carrying tnpA and/or intI genes on plasmidic extract										
Source	Species	Strains	Integrons		Gene Cassettes		tnpA		MOB Subfamilies	
			dot blot	Southern blot	dot blot	Southern blot	dot blot	Southern blot	dot blot	Southern blot
TR-a-WWTP	<i>A. caviae</i>	187F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	491F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	71F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	167F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	197F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	217F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	347F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	397F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	427F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	547F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	597F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	627F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	647F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	677F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	707F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	737F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	767F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	797F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	827F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	857F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	887F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	917F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	947F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	977F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1007F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1037F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1067F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1097F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1127F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1157F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1187F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1217F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1247F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1277F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1307F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1337F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1367F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1397F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1427F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1457F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1487F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1517F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1547F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1577F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1607F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1637F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1667F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1697F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1727F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1757F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1787F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1817F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1847F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1877F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1907F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1937F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1967F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	1997F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2027F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2057F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2087F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2117F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2147F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2177F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2207F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2237F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2267F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2297F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2327F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2357F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2387F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2417F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2447F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2477F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2507F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2537F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2567F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2597F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2627F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2657F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2687F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2717F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2747F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2777F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2807F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2837F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2867F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2897F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2927F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2957F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	2987F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3017F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3047F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3077F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3107F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3137F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3167F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3197F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3227F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3257F-Aer	+	+	dhfr15-antA1-CatB2	+	+	+	+	ND
TR-a-WWTP	<i>A. caviae</i>	3287F-Aer	+	+						