Letter to the Editor

Antimicrobial resistance of *Vibrio cholerae* O1 isolated during a cholera epidemic in 2011 in dry season in Cote d'Ivoire

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Vibrio cholerae O1, a causative agent of cholera, continues to be a major cause of illness and death especially in developing countries [7]. Since 1970 when the first appearance of *V. cholerae* O1 was reported, Cote d'Ivoire has had an evolving cholera epidemic. Several outbreaks occurred in 1983, 1989, 1991, 1994 and 2006 successively. Over 45% of the *V. cholerae* strains were resistant to ampicillin since 1991 and the resistance remained generally high until 2006 with 91.3%. High resistance to cotrimoxazole appeared in 1995 with 56.3% and again in 2006 [2]. Antibiotics are commonly administered as part of the treatment regimen; however, an increase in resistant strains of *V. cholerae* has developed in several countries [6]. The objective of this study was to determine the antimicrobial susceptibility patterns of *V. cholerae* 01 isolated during the cholera epidemic outbreak in Abidjan during the dry season in 2011.

Between January and March 2011, stool specimens and rectal swab samples were collected from patients with acute diarrhea. All samples were plated onto thiosulfate citrate bile sucrose agar (TCBS) and nutritive agar alkaline and alkaline peptone broth and Mueller Kauffman broth. Species identification of *V. cholerae* was performed by standard microbiology methods. Serogrouping and serotyping using immune serum (antiserum *Vibrio cholerae* 01 Bio-Rad F-92430, Marnes la coquette, France) confirmed the diagnosis of cholera. Susceptibility testing was performed using the Kirby-Bauer agar diffusion method. Interpretative categories of resistance were determined according to the French Society of Microbiology Antibiogramm committee (CA-SFM 2010). Quality control was performed with the reference strain *E. coli* ATCC 25922.

Out of 192 samples, 29 (15.1%) were positive for *V. cholerae* O1. All isolates belonged to the Ogawa serotype. Cotrimoxazole resistance was highest with 79.3% followed by tetracycline with 24.1%. For ampicillin, the resistance rate was 20.7%. Ciprofloxacin had the lowest resistance rate of 6.9%. Chloramphenicol and ampicillin showed intermediate resistance of 44.8% and 34.5% respectively (Table 1). Resistance to at least three families of antibiotics defining multidrug resistance was found in 51.7% of isolates. The most frequent resistance pattern was *AmSxtChl* with 17.2%. Resistance to cotrimoxazole (SXT) was always associated with other antibiotics (Table 2).

High resistance to cotrimoxazole has been reported in several countries in Africa. In Zambia, Mozambique and Senegal, resistance rates were 97%, 96.6% and 90.3% respectively [4,5,6]. In Côte d'Ivoire, during the 2006 cholera epidemic outbreak, all strains were resistant to cotrimoxazole. However, since 1995, there has been an increase in the rate of resistance to cotrimoxazole, from 56.3% to 100% in 2006 [2]. Previous use of cotrimoxazole prophylaxis

Table 1. Antimicrobial susceptibility profile of *V. cholerae O1* isolated in Abidjan, Cote d'Ivoire

Antibiotics	R N (%)	I N (%)	R+I N (%)	S N (%)
Ampicillin	6 (20,7)	10 (34,5)	16 (55,2)	13 (44,8)
Amoxicillin + clavulanique acid	3 (10,3)	3 (10,3)	6 (20,7)	23 (79,3)
Cefotaxime	2 (6,9)	0	2 (6,9)	27 (93,1)
Chloramphenicol	4 (13,8)	13 (44,8)	17 (58,6)	12 (41,4)
Cotrimoxazole	23(79,3)	1 (3,4)	24 (82,8)	5 (17,2)
Streptomycin	7 (24,1)	0	7 (24,1)	22 (75,9)
Nalidixic acid	4 (13,8)	2 (6,9)	6 (20,7)	23 (79,3)
Ciprofloxacin	2 (6,9)	0	2 (6,9)	27 (93,1)
Tetracycline	7 (24,1)	0	7 (24,1)	22 (75,9)

R: Resistant; I: Intermediate resistant; S: Susceptible

Table 2. Patterns of resistance to antibiotics of *Vibrio cholerae* O1 isolated in Abidjan, Cote d'Ivoire

Markers of resistance	Patterns of resistance	N	%
0 (n = 1)	sauvage	1	3,4
1 (n = 5)	*Amp*	2	6,9
	Cip	2	6,9
	Sxt	1	3,4
2 (n = 8)	*SxtChl*	5	17,2
	SxtS	1	3,4
	SxtTet	1	3,4
	Amp Sxt	1	3,4
3 (n = 9)	*AmpSxtChl*	5	17,2
	AmpSxtS	2	6,9
	AmpSxtTet	1	3,4
	SxtTetChl	1	3,4
4 (n = 5)	*AmpSxtSChl*	2	6,9
	AmpSxtChlTet	2	6,9
	SxtSTetChl	1	3,4
5 (n = 1)	*AmpSxtSChlTet*	1	3,4
Total		29	100

Amp: Ampicillin; Cip: Ciprofloxacin; Sxt: Cotrimoxazole; Chl: Chloramphenicol; S: Streptomycine; Tet: Tetracycline

among persons living with HIV, as well as for acute respiratory infections and diarrhea in children, may be partly responsible for the extensive increase in antibiotic resistance. Moreover, the assumption of cross-resistance due to the consumption of sulfadoxine-pyrimethamin in the treatment of malaria is also suggested [4]. The highest rates to chloramphenicol (58.6%) were also observed during the cholera epidemics of 1994, 1995, and 2006. In Ethiopia, this resistance was higher with 94% [1]. For ampicillin, resistance remains high with 55.2%, compared to 17.6% recorded in Mozambique and 85% in Ethiopia [4,1]. The emergence and rapid spread of tetracyline-resistant *V. cholerae O1* serotype Ogawa strains was reported in Madagascar, Bangladesh, Tanzania, Zaire and India [3]. In previous cholera outbreaks in Cote d'Ivoire, resistance was relatively low from 1991 to 1995. In 2006, it was 34.8% compared to 24.7% in 2011. Despite the emergence of strains resistant to ciprofloxacin in Asia, the rate is relatively low in some African countries [1,3,4]. The resistance increased from 4.3% in 2006 to 6.9% in 2011 [2]. It should be noted that since 2006, this molecule had been given to patients regularly. These data suggest that ciprofloxacin can still be used as a first-line treatment for cholera in this country. The high rate of MDR (51.7%) may be related to MDR strain emergence around the world including Madagascar [8]. This suggests that cotrimoxazole should not be used empirically in cholera treatment.

In conclusion, continuous surveillance with regard to drug resistance may help in the choice of a standardized scheme of treatment. Further genotypic characterization of *Vibrio cholerae* O1 isolates will be required.

References

1. Abera B, Bezabih B, Dessie A (2010) Antimicrobial susceptibility of *V. cholerae* in Northwest Ethiopia. Ethiop Med J 48: 23-28.
2. Anné BJC, Kacou-N'douba A, Guessennd KN, Tiékoura KB, Koffi KS, Elogne-Kouamé NC, Dosso M (2008) Profiles of antibiotic resistance strains of *Vibrio cholerae* O1 of human origin isolated in Côte d'Ivoire from 1991 to 2006. Bio-Africa 6:15-20.
3. Islam MS, Midzi SM, Charimari L, Cravioto A, Endtz HP (2009) Susceptibility to fluoroquinolones of *Vibrio cholerae* O1 isolated from diarrheal patients in Zimbabwe. JAMA 302: 2321-2322.
4. Mandomando I, Espasa M, Vallès X, Sacarlal J, Sigaupe B, Ruiz J, Alonso P (2007) Antimicronial resistance of *Vibrio cholerae* 01 serotype Ogawa isolated in Manhiça District Hospital, southern Mozambique. J Antimicrobial Chemoter 60: 662-664.
5. Mwansa JC, Mwaba J, Lukwesa C, Bhuiyan NA, Ansaruzzaman M, Ramamurthy T Alam M, Balabrish NG (2007) Multiply antibiotic-resistant *Vibrio cholerae* O1 biotype El Tor strains emerge during cholera outbreaks in Zambia. Epidemiol Infect 135: 847-853.
6. Manga NM, Ndour CT, Diop SA, Dia NM, Ka-sall R, Diop BM, Sow AI, Sow PS (2008) Cholera in Senegal from 2004 to 2006: lessons learned from successive outbreaks. Med Trop 68: 589-92.
7. World Health Organization (2006) Weekly Epidemiological Record, 81: 297-308.
8. Rakoto Alson AO, Dromigny JA, Pfister P, Mauclere P (2001) *Vibrio cholerae* in Madagascar: study of a multiresistant strain. Arch Inst Pasteur Madagascar 67: 6-13.

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