The emergence of Campylobacters multi-resistance: A real problem of public health

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Abstract—Campylobactériose and campylobacters resistance to antibiotics represent a worldwide serious problem of public health; they augment constantly threaten quality and security of care. Campylobacter type causes the majority of food toxi-infection of animal origin. The resistance of these bacteria to many antibiotics prescribed for the treatment of serious illnesses is worrying. According to the analysis of studies made in several countries such as China, Morocco, France and Algeria about the antibiotics susceptibility of campylobacters, show that these microbes are sensitive to aminopenicillins, carbapenenms, aminosids, tetracyclines, macrolides and to fluoroquinolones. However, the massive use of antibiotics for the treatment of infections especially as factors of growth for the animal husbandry drove to emergence of resistance to fluoroquinolones, macrolides and tetracyclines, for example, in some countries, resistance rates to quinolones and cyclines is upper than 90 %.

Index Terms— Campylobactériose, Antibiotics, Feelings in antibiotics, Food Toxi infection; Campylobacters, Public health.

I- INTRODUCTION

The Campylobacter genus is naturally sensitive to carboxy, ureidopenicillines and cephalosporines, because of the porines permeability and by expression of proteins linking the pénicillines (PLP) of a weak affinity. They are resistant to the trimethoprime, rifampicine and colistine [1].
These microbes are sensitive to the amoxicillines, carbapenemes, aminosides, tetracyclines, macrolides and to fluoroquinolones. However, the severe infections caused by Campylobacter jejuni and coli are treated with different antibiotic classes of which the most used are quinolones/ fluoroquinolones and aminoglycosides. But the overconsumption, the misuse of antibiotics, the exchanges of food from animal origin, the use of these antibiotics in food distributed to animal, and the animal husbandry, make lose their effectiveness because of the antibioresistance development of certain strains. These bacteria become more and more resistant to macrolides, β - lactamines, trimethoprime, sulfonamides, tetracyclines, aminoglycosides and to chloramphenicol [2, 3]. That's why these antibiotics must be tested to assess a possible reduction of their sensitivity.
The aim of this synthesis article is to compile the recent data concerning the multidrug resistance of Campylobacter spp.

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II- PREVALENCE OF CAMPYLOBACTER RESISTANCE TO ANTIBIOTICS

According to different studies performed in different countries it was found that; the Campylobacter antibioresistance profil of strains isolated from chickens and pigs (2008-2014) in China, shows that Campylobacter was more resistant to quinolones especially to ciprofloxacine (more than 97 %), to tetracyclines (upper than 91 %), and to macrolides; for C. coli (73 % at the chickens and 54 % at the pigs), and for C. jejuni (10, 5 %) [4]. In France, the surveillance report of infections due to Campylobacter (2015) shows that the rates of resistance achieved 57% to fluoroquinolones, 56,9% to ciprofloxacine, 51% to tetracycline and 34,9% to ampicilline. On the other hand, the rates of resistance to erythromycine remain low (2,5 %) and those of the augmentin and of quasi aminosides are inferior than 1 % [5]. In Morocco (2009) the resistance of Campylobacters to the ciprofloxacine achieved 44, 44 %, 19, 44 % for amoxicillin, and 52, 77 % for tetracyclines [6]. In Algeria (2013) the resistance of Campylobacters to amoxicillin achieved 42 %, 30% for erythromycin and 83, 7 % for tetracycline [7]. Concerning the gentamicine, the rate of resistance is very weak in all countries [6, 7, 8].

III - MECHANISMS OF RESISTANCE OF CAMPYLOBACTER TO DIFFERENT CLASSES OF ANTIBIOTICS

Resistance to macrolides

These antibiotics can block the activity of the peptidyl-transférase [3] and make strains resistant to macrolides slowly divided in vitro, less mobile and having defects in their flagelline [11].

The resistance of *Campylobacter jejuni* and *coli* to macrolides due in general to mutations ; punctual mutation of genes coding for ribosomales proteins L22 and L44 or by modification of the target site of the ribosome on the region 23S of ARNr [9], this last can also confer to *C. jejuni* a resistance to lincosamides [10]. All these mutations lead to a reduction of the affinity of the ribosome for macrolides.

Resistance in Quinolones

The resistance of Campylobacters to quinolones is based principally on a mutation affecting the stage of replication and precisely the enzymes of replication of DNA: DNA gyrase (isomérase type II) encoded by *gyrA* and *gyrB* genes. Mutation in gyrA gene (Thr-86) is the most common, it is linked to high level of resistance to nalidixic acid and to ciprofloxacin than other mutations (Asp-90 or Ala-70) [9]. DNA topoisomérase IV encoded by genes *parC* and *parE* can also present mutations.

The Link between quinolone and DNA is stronger than the link between enzymes and DNA, this leads to an accumulation of the quinolone-DNA complex and to the inhibition of the action of the said enzymes, preventing the replication of DNA and the stopping the bacterial growth [3].

Resistance to tetracyclines

The resistance of Campylobacters to tetracyclines is in general linked to *tet (O)* and *tet (M)* genes, which encode either for proteins of efflux or for proteins of protection of the ribosome, because the protein tet (0) procreates a change of conformation of the ribosome preventing the fixing of the tétracycline and thus allowing the pursuit of proteins synthesis [9]. The rate of resistance is remains limited in comparison with that of the macrolides.

Resistance to beta-lactams: Amoxicillin

The resistance of Campylobacters to beta - lactams and especially to the amoxicillin is mainly due to the impermeability of the membrane [12], because of the beta-lactamases secretions by the bacterial wall which inactivate the action of the amoxicillin [13]. However this action is restored by the combination of the amoxicillin with clavulanic acid which inhibits the action of beta-lactamases and cancels the action of these enzymes [14, 3].

This mechanism is especially made by Campylobacters at the level of the *blaoxa-61* gene which encodes in one of these enzymes that is an oxacillinase, not much inhibited by clavulanic acid [15]. Resistance seems to be chromosomal [16].

IV- CONCLUSION

The punctual or massive use of antibiotics in human health being for the treatment of the infections of campylobacteriosis and especially the use of antibiotics in poultry sector as factors of growth and benefit of bodily mass generates in the course of time the emergence and the increase of bacterial resistance. There is a double risk of farmers and consumers of meat resistant bacteria transmission via the food chain which result in a therapeutic failure. To fight antibiotic resistance, it is necessary to sensitize professional of health and the general public so they can be up-to-date regarding the consumption of antibiotics to assure quality and ensure security of human and animal health.

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