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Bacterial Resistance

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Nowadays, bacterial resistance to the different antibiotics is a major public health problem [1-4]. Recent outbreaks, like the one found in Germany for *E. coli* O104 [5,6] as well as the emergence of multi-drug resistant organisms, such as gram-negative *Enterobacteriaceae* associated to the New Delhi metallo β-lactamase [7-9] evidence this problem [4,10-12], that not only has public health implications, but also at an economic and social level, threatening global safety [13,14]. The latest studies reported also the significant financial burden on health care-associated infections (HAIs) in the USA[15,16]. In the UK, approximately 9% of hospitalized patients acquire an infection after post-admission to hospital which increases the budget in the health care system [15,17].

Until approximately 1960, scientists produced and developed more, than 20 new classes of antibiotics. Since then, only two new classes of antibiotics have appeared [18]. The problem of resistance presented by bacteria is well known for approximately 20 years or more but pharmaceutical industry does not invest in development of new antibiotics [18]. This may be due to the fact that the period necessary for bacteria to develop resistance is becoming shorter [19], and consequently increases the challenges that pharmaceutical industry faces [20]. Instead of developing new antimicrobial agents that prove to be more expensive and unsuccessful [19], scientific community opt for another approach – modification of existing antimicrobial agents and further studies [19,21].

This could lead to the use of non-antibiotics compounds that have antimicrobial properties [21,22]. These molecules could act through a new mechanism, or may interfere with the developed resistance mechanism, and could revert the resistance phenotype, previously presented. In the last case, for example, the mechanism of action may be: an alteration of membrane permeability to antibiotics [22], inhibition of efflux pumps [23], or the inhibition of beta-lactamases, when the resistance mechanism is present.

In this context, it is important to know and study the resistance mechanisms, and also study non-antibiotics compounds as antimicrobial agents.

References

1. Ferraz R, Branco LC, Marrucho IM, Araujo JMM, Rebelo LPN, et al. (2012) Development of Novel Ionic Liquids-APIs based on Ampicillin. MedChemComm.
2. Amador P, Fernandes R, Brito L, Prudencio C (2011) Antibiotic resistance in *Enterobacteriaceae* isolated from portuguese deli meats. Journal of Food Safety 31: 1-20.
3. Amador P, Fernandes R, Duarte I, Brito L, Prudencio C (2011) *In vitro* transference and molecular characterization of bla_{TEM} genes in bacteria isolated from Portuguese ready-to-eat foods. World J Microbiol Biotechnol 27: 1775-1785.
4. Fernandes R, Prudencio C (2010) Post-surgical wound infections involving *Enterobacteriaceae* with reduced susceptibility to β-lactams in two Portuguese hospitals. Int Wound J 7: 508-514.
5. Pennington H (2011) Escherichia coli O104, Germany 2011. Lancet Infect Dis 11: 652-653.
6. Bielaszewska M, Mellmann A, Zhang W, Koeck R, Fruth A, et al. (2011) Characterisation of the *Escherichia coli* strain associated with an outbreak of haemolytic uraemic syndrome in Germany, 2011: a microbiological study. Lancet Infect Dis 11: 671-676.
7. Tseng SH, Lee CM, Lin TY, Chang SC, Chang FY (2011) Emergence and spread of multi-drug resistant organisms: think globally and act locally. J Microbiol Immunol Infect 44: 157-165.
8. Kumarasamy KK, Toleman MA, Walsh TR, Bagaria J, Butt F, et al. (2010) Emergence of a new antibiotic resistance mechanism in India, Pakistan, and the UK: a molecular, biological, and epidemiological study. Lancet Infect Dis 10: 597-602.
9. Mochon AB, Garner OB, Hindler JA, Krogstad P, Ward KW, et al. (2011) New Delhi Metallo-beta-Lactamase (NDM-1)-Producing *Klebsiella pneumoniae:* Case Report and Laboratory Detection Strategies. Journal of Clinical Microbiology 49: 2386.
10. Amador P, Fernandes R, Prudencio C, Brito L (2009) Resistance to Beta-lactams in Bacteria Isolated from Different Types of Portuguese Cheese. Int J Mol Sci 10: 1538-1551.
11. Fernandes R, Vieira M, Ferraz R, Prudencio C (2008) Bloodstream infections caused by multidrug-resistant *Enterobacteriaceae*: report from two Portuguese hospitals. J Hosp Infect 70: 93-95.
12. Fernandes R, Gestoso A, Freitas JM, Santos P, Prudencio C (2009) High resistance to fourth-generation cephalosporins among clinical isolates of *Enterobacteriaceae* producing extended-spectrum beta-lactamases isolated in Portugal. Int J Antimicrob Agents 33: 184-185.
13. zur Wiesch PA, Kouyos R, Engelstaedter J, Regoes RR, Bonhoeffer S (2011) Population biological principles of drug-resistance evolution in infectious diseases. Lancet Infect Dis 11: 236-247.
14. Albrich WC, Harbarth S (2008) Health-care workers: source, vector, or victim of MRSA? Lancet Infect Dis 8: 289-301.
15. Busetti A, Crawford DE, Earle MJ, Gilea MA, Gilmore BF, et al. (2010) Antimicrobial and antibiofilm activities of 1-alkylquinolinium bromide ionic liquids. Green Chem 12: 420-425.
16. Scott II RD (2009) The direct medical costs of Healthcare-Associated Infections in U.S. Hospitals, and benefits of prevention. USA: Centers for Disease Control and Prevention.
17. Plowman R, Graves N, Griffin MA, Roberts JA, Swan AV, et al. (2001) The rate and cost of hospital-acquired infections occurring in patients admitted to selected specialties of a district general hospital in England and the national burden imposed. J Hosp Infect 47: 198-209.
18. Coates AR, Halls G, Hu Y (2011) Novel classes of antibiotics or more of the same? Br J Pharmacol 163: 184-94.

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19. Schwarz S, Kehrenberg C (2006) Old dogs that learn new tricks: Modified antimicrobial agents that escape pre-existing resistance mechanisms. Int J Med Microbiol 296: 45-49.

20. Ferraz R, Branco LC, Prudencio C, Noronha JP, Petrovski Z (2011) Ionic Liquids as Active Pharmaceutical Ingredients. ChemMedChem 6: 975-985.

21. Martins M, Dastidar SG, Fanning S, Kristiansen JE, Molnar J, et al. (2008) Potential role of non-antibiotics (helper compounds) in the treatment of multidrug-resistant Gram-negative infections: mechanisms for their direct and indirect activities. Int J Antimicrob Agents 31: 198-208.

22. El-Nakeeb MA, Abou-Shleib HM, Khalil AM, Omar HG, El-Halfawy OM (2012) Reversal of antibiotic resistance in Gram-positive bacteria by the antihistaminic azelastine. APMIS 120: 215-220.

23. Prudencio C, Sansonetty F, Sousa MJ, Corte-Real M, Leao C (2000) Rapid detection of efflux pumps and their relation with drug resistance in yeast cells. Cytometry 39: 26-35.