

Title: SYNERGISTIC EFFECT OF OREGANO ESSENTIAL OIL AND SILVER NANOPARTICLES AGAINST EXTENDED-SPECTRUM B-LACTAMASE (ESBL)-PRODUCING *ESCHERICHIA COLI* STRAINS.

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Abstract:

The emergence of resistant bacteria to conventional antimicrobials is a clinic and public health problem. Therapeutic failures in infection control leads to high costs with treatment and mortality. Betalactamase is an important resistance mechanism displayed by Gram-negative bacteria; and as betalactams were being developed, new enzymes have emerged, including extended-spectrum β -lactamase (ESBL). ESBL-producing strains implicates in limitation of treatment choices due to multidrug resistance. Alternative antimicrobial are currently being developed and approaches plants and derivatives compounds, animal and microbial metabolites, nanodrugs, combination therapy and others. This study evaluated antibacterial effect of double drug combination composed of biological synthesized silver nanoparticle (BioAgNano) and oregano essential oil (OEO) against ESBL-producing *Escherichia coli*. BioAgNano were obtained after reduction of metal ions by *Fusarium oxysporum* (patented synthesis process - 2014, BR1020140323198; <http://www.inpi.gov.br>) and OEO were get commercially. Minimal inhibitory concentration values of both antimicrobials were determined by broth microdilution method according CLSI (2012), with necessary modifications. Synergic assay of BioAgNano and OEO was determined by broth dilution in double-antimicrobial gradient, and fractional inhibitory concentrations index was used to describe drug interaction. Those assays were realized with three ESBL-producing *Escherichia coli* strains. Both antimicrobials have synergic effect against all three ESBL-producing *E. coli* and this combination have bactericidal activity. Reducing minimum inhibitory concentration of antimicrobial agents is important to decrease treatment costs and possible toxicity of compounds. Besides, combination therapy can affect resistant strain selection. This composition is potentially useful in disinfectants, antiseptics and other products, being a good alternative to treat and control infection caused by multi-drug resistant bacteria.

Keywords: oregano essential oil, silver nanoparticle, antimicrobial activity, ESBL.

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