

# Antimicrobial Activity of Organic Herbal Extracts Infused With Ozone as a Combination Therapy on *Helicobacter pylori*

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Recurrent exposure to antibiotics is a form of stress that renders the carcinogenic *Helicobacter pylori* highly resistant to antimicrobial therapy. To our knowledge, the effect of ozonated AKBA (extracted from frankincense oil) has never been tested on *H. pylori*, therefore, this study aims to investigate possible genetic and membrane damage as a mechanism of antimicrobial activity of ozonated AKBA extracted from organic frankincense on *H. pylori*. In vitro Antimicrobial activity of ozonated AKBA extracts which is readily available in Oman, was tested on 23 *H. pylori* clinical isolates from gastric biopsy samples using broth microdilution method of ozone-infused extracts in two-fold serial dilutions. Florescent dyes were used to assess for cell viability. AKBA was tested on the peripheral blood mononuclear cells which to assess for cytotoxicity. Ozonated AKBA against *H. pylori* resulted in significant log reduction from 16 to 4 mg/ml. Electron microscopic imaging showed pronounced membrane damage. In addition, cell viability by chemi-luminescent assays were reduced, thus proving the direct activity of the ozonated-AKBA on the bacterial cells. Further genetic assays by sequencing to examine the genetic changes related to enzymatic expression suggested direct positive effect on virulence enzymes. Ozonated-AKBA exerts positive synergistic activity against *H. pylori* in-vitro by directly damaging the cellular membrane with possible distortion of enzymatic processes. This therapeutic combination could provide promising application to a wide range of bacterial infections and further experimentation and research is needed for future clinical applications. The cost of the project is \$20.

## Awards Won:

King Abdulaziz &

his Companions Foundation for Giftedness and Creativity: Full Scholarship from King Fahd University of Petroleum and Minerals(KFUPM) (and a \$400 cash prize)

Sigma Xi, The Scientific Research Honor Society: Third Life Science Award of \$500