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Apple cider vinegar (ACV®) displays potent antibiotic activity directly against *Escherichia coli and Candida albicans* and within *in vitro* monocytes exposed to microbes by inhibiting inflammatory cytokine secretion

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Introduction: Extraintestinal pathogenic Escherichia coli (E-coli) are the most frequent cause of blood borne, urinary tract and hospital acquired infections. *Candida albicans* infection can also pose a huge threat especially following transplantation and to immune compromised patients. Globally there has never been a more desperate time for novel anti-microbial agents to target microbes and multi drug resistance from bacterial or fungal associated infections.

Aim: The aim of this study was to investigate the potential anti-microbial effects of ACV®. We used microbial strains: *E. coli* strain 6571, *C. albicans* strain 90828 purchased from ATCC.

Methodology: We tested the effect of commercial ACV® directly on microbial cultures over a 24 hour period, measuring inhibition zones. We also looked at whether ACV® could have an anti-inflammatory effect *in vitro*. This was tested using human blood derived monocytes which were incubated with microbes and AVC®. The collected supernatants were analyzed for pro-inflammatory cytokine secretion by ELISA.

Results: When monocytes were cultured with both microbes they secreted TNFα and IL-1β. ACV® was able to significantly inhibit E-coli growth demonstrated by the results of direct co-culture with each of the microbial inoculums and ACV® in varying concentrations. The zone of inhibition with the addition of ACV® to each of the microbes varied dose dependently ACV® concentration. For *Candida albicans* undiluted ACV® had the strongest effect, whereas on E-coli cultures, the most potent effect was visible at lower dilutions including 1/1000 dilution of the neat solution ($p<0.05$). When monocytes were cultured with both microbes they secreted inflammatory cytokines (TNFα, IL-1β) ACV® was effective in significantly inhibiting inflammatory cytokine secretion in human peripheral blood monocytes cultured with *E. coli* and *Candida albicans*

Conclusion and significance: ACV® displayed potent anti-microbial and anti-inflammatory activity against *E. coli* and *Candida albicans*. We propose that ACV® could be potentially therapeutic in cases of antibiotic resistance and sepsis.

Biography

Darshna Yagnik is a Lecturer of Immunology and Biomedical Sciences at Middlesex University. Her research is based on human *in vitro* models of mononuclear cell differentiation and their role in inflammatory pathways and particularly the resolution phase of inflammation.

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