The Effect of Varied Macrophage Cell Concentration on Tumor Necrosis Factor-α Production in Response to Garlic in the Presence and Absence of Lipopolysaccharide

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Abstract
Folkloric medicine has had it for thousands of years that garlic’s effect during an infection or viral contraction is positively correlated with increased healing potential. Garlic is found to stimulate the production of Tumor Necrosis Factor-alpha (TNF-α), a pro-inflammatory immune-regulatory molecule (cytokine), when in contact with receptors on macrophage cells. This cytokine is most readily produced in response to Lipopolysaccharide (LPS). LPS is a component in the cell wall of the gram-negative bacteria E. Coli. In our lab, we have found that garlic both stimulates TNF-α production of murine macrophages as well as amplifies the affect when combined with LPS. The goal of this project is to determine whether the effect of garlic is dependent on cell density. Thus, production of murine macrophages as well as amplifies the affect when combined with LPS. The murine macrophage cell line J774A.1 was plated at 4 different densities (5x10^5 cells/ml, 1.25x10^5 cells/ml, 2.5x10^5 cells/ml, and 0.625x10^5 cells/ml). Twenty four hours later, the cells were treated with garlic (G) diluted 1:500 (G1:500) in pyrogen free water (PFW), in the absence or presence of LPS. Untreated cells and cells treated with PFW served as controls. Twenty four hours after treatment, cell supernatants were collected and stored at -80°C until analyzed for the presence of LPS. The data is reflective of the means +/- standard deviation of a total of 7 experiments.

Materials and Methods

Garlic stimulates TNF-α secretion in the absence and presence of LPS

The average percent increase was taken at all concentrations as an observation of the average effect of garlic in the presence and absence of LPS. The data is reflective of the means +/- standard deviation of a total of 7 experiments.

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Hypothetical Results

The hypothetical graph of TNF-α production is based upon the assumption that a proportional amount of TNF-α will be produced according to cell concentration. The standard 1.25 X 10^5 cells/ml concentration was used to hypothesize this outcome.

Results

Garlic stimulates TNF-α production in the presence and absence of LPS

The production of TNF-α increases as cell concentration increases. Therefore, in all circumstances within our experiment, garlic elevates TNF-α production. Garlic is therefore found to have a pro-inflammatory effect in our settings.