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File: ■ Garlic (*Allium sativum*, Amaryllidaceae)
■ Nosocomial Infections

HC 071733-584

Date: January 15, 2018

RE: Garlic Supplementation Effective in Patients Susceptible to Nosocomial Infections in Hospital Intensive Care Units

Madineh H, Yadollahi F, Yadollahi F, Mofrad EP, Kabiri M. Impact of garlic tablets on nosocomial infections in hospitalized patients in intensive care units. *Electron Physician*. 2017;9(4):4064-4071.

Nosocomial infections, a leading cause of mortality and morbidity in hospitals, occur 48 to 72 hours after admission, most often in intensive care units (ICUs). These infections affect 25% of all ICU patients in developed countries and an estimated 50% of ICU patients in developing countries. Pneumonia and urinary tract infections are the most common nosocomial infections, with aerobic bacteria being the most common cause, and sepsis is the deadliest consequence of hospital-acquired infections. Catheterization is the most common cause of urinary tract infections. Studies suggest that garlic (*Allium sativum*, Amaryllidaceae) is effective against Gram-positive, Gram-negative, and acid-fast bacteria. The primary constituent responsible for garlic's antibacterial activity is allicin, which exhibits sulfhydryl-modifying and -inhibiting activities. Furthermore, previous research has shown that garlic extracts hinder the biological activity of microbes by decreasing oxygen uptake, reducing organism growth, and inhibiting the biosynthesis of significant bacterial compounds such as lipids, proteins, and nucleic acids, and damaging bacterial membranes. These authors conducted a randomized, double-blind, clinical trial to examine the impact of garlic tablets on nosocomial infections in patients hospitalized in an ICU.

This study included 100 patients aged 15 to 55 years who were admitted to the general adult ICUs of Kashani and Al-Zahra hospitals in Shahrekord, Iran, from January 21, 2014, to December 20, 2014. The patients were randomly assigned to a garlic group (n=50) or a control group (n=50). Patients in both groups were matched in age, gender, and antibiotic intake. Three patients from each group did not complete the study. Patients in the garlic group received one 400-mg garlic tablet (Gol Darou Company; Esfahan, Iran) in powder form daily for 6 days. Powder from the capsule was dissolved in distilled water and administered through a nasogastric tube, followed by flushing of the nasogastric tube with water. Patients in the control group were administered starch tablets in the same manner.

For up to 6 days, venous catheter tips were replaced every 72 hours and sent to the laboratory under sterile conditions for culture and antibiotic sensitivity tests. Upon a change in a urinary catheter, its tip was sent to the laboratory for culture and antibiotic sensitivity test. Blood samples were drawn every 72 hours for determination of total blood counts and blood

sugar levels; urinary samples were collected to evaluate white blood cell counts. Body temperature was measured every 6 hours. Erythrocyte sedimentation rate and C-reactive protein, markers of inflammation, were measured at baseline and every 48 hours for up to 6 days.

The primary outcomes for both groups were blood sugar levels, total blood cell counts, and body temperature. Secondary outcomes were urinary white blood cells, coagulation markers (international normalized ratio, prothrombin time, and partial thromboplastin time), and patient satisfaction with the intervention.

The authors report that the mean body temperature was significantly higher in the control group than in the garlic group on day 2 and day 4 ($P<0.05$ for both) [Note: This is not indicated in Table 2, in which the P value for day 4 is 0.09.]; the between-group difference in body temperature changes was significant ($P=0.007$). No significant changes were seen in either group in the coagulation markers, white blood cells, red blood cells, and fasting blood sugar levels as recorded on days 1, 3, and 6.

During the study, 78 venous catheter tips (37 from the garlic group and 41 from the control group) were examined in the laboratory. Of those, 5 from the control group tested positive; no catheter tip from the garlic group tested positive. The frequency distribution of catheter tip culture was significantly higher in the control group compared with the garlic group ($P=0.03$).

Urine samples were taken from 36 patients in the garlic group and 32 patients in the control group. The mean of urinary white blood cells in the garlic group was 4.41 ± 4.04, and 4.48 ± 4.1 in the control group, with no significant between-group difference ($P=0.48$). Results from culture tests taken from 35 patients in the garlic group and 30 patients in the control group revealed no significant between-group difference ($P=0.13$).

One patient in the garlic group died during the study from an unrelated cause.

This study is limited by its small sample size, primarily the result of the study being conducted in patients hospitalized in the ICU. The authors suggest that similar research be conducted in other hospital departments; that findings of this study be provided to physicians of other hospital departments; that garlic consumption be considered a preventive strategy against nosocomial infections; that the research be repeated in a larger population; and that the public be educated about garlic's antimicrobial potential.

The authors conclude that "garlic supplementation has shown to be effective in patients admitted to intensive care units and those who are highly susceptible to nosocomial infection, and it can be used for the prevention of septicemia and urinary tract infections. Further research with larger sample size is needed."

The study was financially supported by Shahrekord University of Medical Sciences in Shahrekord, Iran.

—Shari Henson

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