



HerbClip™

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- ILE:** ■ **Garlic** (*Allium sativum*)
■ **Garlic-derived Compounds**
 ■ **Gentamicin**
■ **Herb-drug Interactions**

HC 120751-306

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RE: Effect of Garlic Extracts and Garlic-derived Compounds on the Antibiotic Activity of Gentamicin

Maldonado PD, Chánez-Cárdenas ME, Pedraza-Chaverrí J. Aged garlic extract, garlic powder extract, S-allylcysteine, diallyl sulfide and diallyl disulfide do not interfere with the antibiotic activity of gentamicin. *Phytother Res.* 2005;19:252-254.

Gentamicin (GM) is an antibiotic commonly used to treat life-threatening gram-negative infections. However, 10-20% of patients treated with this drug for more than 7 days develop signs of kidney damage. Although the mechanism of GM induced nephrotoxicity is unknown, it has been proposed that oxidative stress and reactive oxygen species play a role.

A substance that would protect against or reverse GM induced renal damage would greatly expand the clinical usefulness of this drug. Prior research has demonstrated that aged garlic (*Allium sativum*) extract, garlic powder extract, and several garlic-derived compounds alleviate nephrotoxicity induced by GM in the rat. The purpose of the present study is to ascertain whether these compounds can be utilized as an adjuvant to GM, without interfering with its antibiotic activity.

The materials being researched are:

- 1) Aged garlic extract (AGE) — (Wakunaga of America, Mission Viejo, CA)
- 2) Garlic powder extract (GPE) — (Garlic powder from McCormick, Mexico City, Mexico)
- 3) S-allylcysteine (SAC) — (Synthesized in the authors' laboratory: Laboratorio de Patología Vascular, Instituto Nacional de Neurología y Neurocirugía Dr. Manuel Suárez, Mexico City, Mexico)
- 4) Diallyl sulfide and diallyl disulfide (DAS and DADS) — (LKT Laboratories, St. Paul, MN)
- 5) GM — (Schering Plough, Mexico City, Mexico)

A colony of *Escherichia coli* was grown overnight in a Luria-Bertani (LB) culture medium. Sterile test tubes were prepared with 5 mL of the LB media and equal parts of the *E. Coli* culture. The optical density of these control tubes (CT) at 600 nm (OD_{600nm}) was adjusted to 0.1. Three additional types of tubes were prepared for the first experiment:

- 1) GM tubes containing the minimum inhibitory concentration of GM (2.7 $\mu\text{g/mL}$)
- 2) Tubes containing 1 mg/mL of AGE, or GPE, or SAC, or DAS, or DADS
- 3) GM+AGE, GM+GPE, GM+SAC, GM+DAS and GM+DADS tubes, containing 2.7 $\mu\text{g/mL}$ of GM plus 1 mg/mL of one of the garlic preparations

These tubes were incubated at 37 C for 2 hours. The effect of the various garlic preparations on *E. coli* growth and on the antibiotic activity of GM was assessed by measuring the change in optical density of the tubes in comparison with the baseline value. Results showed that GM alone significantly decreased OD at 600 nm, indicating an inhibition of bacterial growth ($P < 0.001$ vs. CT). The 2 garlic extracts (AGE and GPE) did not significantly inhibit bacterial growth, but the 3 garlic-derived compounds (SAC, DAS and DADS) each caused a significant decrease in OD ($P < 0.001$ vs. CT).

In the second part of the experiment, 9 tubes were prepared combining GM with 3 different concentrations of SAC (0.25 mg/mL, 0.5 mg/mL, and 1 mg/mL), GM with 3 concentrations of DAS, and GM with 3 concentrations of DADS. The antibiotic activity of all 9 combinations was statistically significant ($P < 0.001$ vs. CT). In addition, all 3 of the GM+DAS combinations, as well as the 3 GM+DADS combinations significantly increased the antibiotic activity of GM against *E. coli* ($P < 0.001$ vs. GM alone).

Several interactions between garlic and prescription drugs have been suggested in the medical literature. These include bleeding (warfarin with garlic), a hypoglycemic effect (chlorpropamide and garlic), and pharmacokinetic changes (paracetamol and garlic). The data from this study suggest that garlic may be given in conjunction with GM to ameliorate that drug's renal toxicity, without inhibiting its antibiotic activity. Further research is needed to establish that garlic does not impact the bioavailability of GM.

— Cathleen Rapp, N.D.

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