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## The Antibacterial Activity of Gentamicin Sulphate in NaCl and Dextrose-NaCl Infusion against Escherichia coli Atcc 25922 and Staphylococcus aureus Atcc 29213

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### Abstract

Gentamicin sulphate mixed into the fluid infusion of NaCl and dextrose-NaCl is the process of intravenous admixtures, where knowledge about sterility, physicochemistry and stability properties of drugs, incompatible of drugs and the risk of exposure are matter to be considered. An already reconstituted drug has a time limit of stability and the long-time mixing will decrease its activity in inhibiting bacteria. The study aims was to determined the antibacterial effect of

the infusion of 0.9% NaCl and 5% dextrose-0.225% NaCl against Escherichia coli and Staphylococcus aureus, the influence of time variation of the use of gentamicin sulphate injection, and the effect of interaction of infusion and time of use towards its activity on bacteria. The laboratory experiment research method was done, which included mixing sterile preparation of gentamicin sulphate injection into NaCl and dextrose-NaCl infusion in LAF, tested antibacterial activity against Escherichia coli and Staphylococcus aureus and data analyzed with ANOVA. The results showed that the type of fluid infusion was only influential as antibacterial activity against Staphylococcus aureus but not against Escherichia coli. On the other hand, the use of time variation was effective on gentamicin sulphate activity against both bacteria. Also, the interaction of fluid infusion with time of use has no effect on its activity on bacteria.

## Keywords

5% dextrose, 0.225% NaCl, 0.9% NaCl, Escherichia coli, gentamicin sulphate injection, Staphylococcus aureus.

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Research Article

## The Antibacterial Activity of Gentamicin Sulphate in NaCl and Dextrose-NaCl Infusion against *Escherichia coli* Atcc 25922 and *Staphylococcus aureus* Atcc 29213

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### ABSTRACT

Gentamicin sulphate mixed into the fluid infusion of NaCl and dextrose-NaCl is the process of intravenous admixtures, where knowledge about sterility, physicochemistry and stability properties of drugs, incompatible of drugs and the risk of exposure are matter to be considered. An already reconstituted drug has a time limit of stability and the long-time mixing will decrease its activity in inhibiting bacteria. The study aims was to determined the antibacterial effect of the infusion of 0.9% NaCl and 5% dextrose-0.225% NaCl against *Escherichia coli* and *Staphylococcus aureus*, the influence of time variation of the use of gentamicin sulphate injection, and the effect of interaction of infusion and time of use towards its activity on bacteria. The laboratory experiment research method was done, which included mixing sterile preparation of gentamicin sulphate injection into NaCl and dextrose-NaCl infusion in LAF, tested antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* and data analyzed with ANOVA. The results showed that the type of fluid infusion was only influential as antibacterial activity against *Staphylococcus aureus* but not against *Escherichia coli*. On the other hand, the use of time variation was effective on gentamicin sulphate activity against both bacteria. Also, the interaction of fluid infusion with time of use has no effect on its activity on bacteria.

**Keywords:** 5% dextrose, 0.225% NaCl, 0.9% NaCl, *Escherichia coli*, gentamicin sulphate injection, *Staphylococcus aureus*.

### INTRODUCTION

Infectious diseases are a major issue and still ranks high among health issues in developing countries including Indonesia, which has also contributed significantly to the number of illnesses and deaths<sup>1</sup>. One of the most deadly infectious diseases in Indonesia is diseases of the gastrointestinal tract. In addition to causing death, this disease is also a cause of nosocomial infections<sup>2</sup>. The spread of the disease can occur from one person to another, or from animal to human. The infection of the digestive tract, among others, can be caused by *Escherichia coli* and *Staphylococcus aureus* bacteria<sup>3</sup>.

Diseases caused by bacteria or pathogenic microorganisms can be cured with antibiotic therapy<sup>4,5</sup>. Treatment is generally in the form of a aminoglycoside plus ampicillin<sup>6</sup>. New antibiotics or modification of existing antibiotics are needed to respond to the development of bacteria resistant to antibiotics. Gentamicin sulphate has the ability to kill *Escherichia coli* bacteria<sup>7</sup>. Gentamicin sulphate antibiotic is the most widely used due to the relatively broad spectrum of its antibacterial properties and resistance to heat<sup>8,9</sup>. These antibiotics work by inhibiting protein synthesis mechanism<sup>8</sup>. Antibiotics are widely used as chemotherapy drugs to prevent and treat bacterial

infections<sup>10</sup>. Gentamicin is commonly used to treat severe infections caused by *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella* spp., *Enterobacter* spp., *Serratia* spp and for prophylaxis against endocarditis mainly<sup>11</sup>.

Gentamicin sulphate is formulated in the form of dry injection due to its instability as a solution. According to the Indonesian Ministry of Health, gentamicin sulphate is compatible in 0.9% NaCl, 5% dextrose, 10% dextrose, 5% dextrose-0.225% NaCl, ringer's, and ringer's lactate solutions<sup>12</sup>. Gentamicin sulphate mixed into the fluid infusion of NaCl and dextrose-NaCl is the process of mixing intravenous infusion. Mixing the intravenous infusion should be performed by a pharmacist in Hospital Pharmacy Installation with sufficient background knowledge of, among others, sterility, physicochemistry and stability properties of drugs, incompatibility of drug, and drug exposure hazards<sup>13,14</sup>. The place and long storage also affect the stability of the drug. A drug that is already reconstituted has a time limit of stability and the long-time mixing will decrease its activity in inhibiting bacteria<sup>15</sup>.

According to Monica et al, the use of ringer's lactate solution and ringer's dextrose in mixing of gentamicin sulphate injection has an effect on antibacterial activity of