CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
S1615

Project Title
Role of Intravenous Fluids in Treating Gram Negative Sepsis

Abstract

Objectives/Goals
To study the effect of 3% saline on gram negative bacterial solutions in vitro and to see whether this effect is additive/synergistic with the antibiotic Meropenem.

Methods/Materials
Using known controls for Pseudomonas aeruginosa, Klebsiella pneumoniae carbapenemase producing bacteria (KPC), Klebsiella pneumoniae, and Escherichia coli (E. coli) and the Prompt Inoculation System-D, a standardized bacterial suspension of each bacterium was prepared. 20 µl of each bacterial suspension was added to 2 tubes each containing 3 ml of sterile inoculum water. One tube was used as a control for each bacterium. 3 ml of 3% saline was added to the second tube for each bacterium. After mixing the solutions well, 100 µl of each bacterial solution was plated on to 2 blood agar plates each. A 10 µg Meropenem disc was placed on one of the plates for each bacterium. 100 µl of each bacteria + 3% saline solution was plated on to 2 blood agar plates each. A 10 µg Meropenem disc was placed on one of the plates for each bacterium. After incubating overnight at 37º C with 5% CO2, the number of colonies on each plate was counted and the zone of clearing around the Meropenem disc was measured.

Results
For KPC, average colony counts were 435.5 for the control, 184 for KPC with 3% saline, 269 for KPC + meropenem and 182.5 for KPC + 3% saline + meropenem. For E. Coli, average colony counts were 245.5 for the control, 82.5 for E. Coli with 3% saline, 85 for E. Coli + meropenem and 36.5 for E. Coli + 3% saline + meropenem. For Pseudomonas aeruginosa (PA), average colony counts were 67 for the control, 52.5 for PA with 3% saline, 39 for PA + meropenem and 29.5 for PA + 3% saline + meropenem. For Klebsiella pneumoniae (KP), average colony counts were 326 for the control, 157 for KP with 3% saline, 231.5 for KP + meropenem and 56 for KP + 3% saline + meropenem. Average zones of clearing with Meropenem disc were 21 mm for KPC, 24 mm for KPC with 3% saline, 44.5 mm for E. Coli, 47.5 mm for E. Coli with 3% saline, 37 mm for PA, 41.5 mm for PA with 3% saline, 39 mm for KP, and 43 mm for KP with 3% saline.

Conclusions/Discussion
The combined effect of 3% saline and Meropenem was greater than if either one was used independently, as demonstrated by both colony counts and zone of clearing. This shows that using hypertonic solutions like 3% saline with antibiotics may be a better choice for patients with sepsis due to gram negative bacteria.

Summary Statement
I showed that hypertonic IV solutions like 3% saline increased the effect of the antibiotic Meropenem against gram negative bacteria.

Help Received
Ms. Victoria Go mentored me and helped me conduct the experiments.