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Interdisciplinary Research with Nursing and Biology: Identification of Effective Disinfectants on Microbial Growth

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Research and Creative Experience for Undergraduates (RCEU) Proposal

Interdisciplinary Research with Nursing and Biology:
Identification of Effective Disinfectants on Microbial Growth

Faculty/Research Mentor
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Laboratory work will be with Dr. Joseph Leahy in the College of Science and Department of Biology.

Project Summary

Overview/Specific Aims. Oropharyngeal and nasopharyngeal suctioning is frequently perfumed at the time of birth of neonates to clear secretions in the mouth and nose, open the airways, and stimulate respirations. Bulb syringes are suction devices used nationally and internationally. The most common device is a blue bulb syringe, and it is portable, easy to use, manual squeeze creates a vacuum, no electricity is required, and it is cheap. Hospital cost is only fifty cents per bulb, and retail cost may vary between $5.00 and $8.00 per bulb. No research identifies effective cleaning of the bulb syringe based on microbial growth found in the bulb. Cleaning recommendations are provided by the manufacturer which suggests soap and water on a routine basis and sterilization at 100 degrees Fahrenheit for 8-10 minutes prior to storage. The effectiveness of disinfecting or cleaning with soap and water is not known. Studies have documented suction equipment becomes contaminated with gram positive and negative bacteria. A current study being conducted by Dr. O'Neal and Dr. Leahy has identified gram positive and negative bacteria are present in bulb syringes that were collected at time of neonatal delivery and discharge. The progressive next step of a multi-phase study is to identify how to easily and effectively disinfect bulb syringes to kill growing gram negative and positive bacteria.

The specific aim of this study is to identify solutions that kill specific gram positive and negative bacteria known to grow in bulb syringes. The study will be quasi-experimental in design. Experimental solutions will be mixtures of isopropyl alcohol, germicidal bleach, and dish detergent, and the control group will be water only. This will be a laboratory based experiment that will take place in Dr. Jo Leahy's lab. This project is suitable for an honors thesis research project.

Figure 1. Laboratory Experiment to Identify Effective Disinfectants of Blue Bulb Syringe and Gram Positive and Gram Negative Bacteria.

Student Involvement

Student Duties. The undergraduate student will collaborate with an interdisciplinary team of researchers, Dr. O'Neal (Nursing) and Dr. Leahy (Biology), to contribute new knowledge to the fields of nursing and microbiology. This interdisciplinary research opportunity will involve the student regularly working in the laboratory to test different disinfectants on gram positive and gram negative bacteria and measure germicidal outcomes. The student duties will involve mixing numerous disinfectants, taking samples of gram negative and gram positive bacteria, exposing the disinfectant to the bacteria, and monitoring for bactericidal effectiveness. Once an effective solution is identified, then the solution will be used in contaminated blue bulb suction aspirators to determine the presence or destruction of existing bacteria.

Student Qualifications. The student will be expected to be autonomous and self-directed as this person will have the responsibility for identifying and testing disinfectants and microbial inhibition or growth in the lab. It is projected that 75% of the students' time will involve laboratory work, and 25% of the time the students will be analyzing the data and writing abstracts. This will match with any honor students' interest in learning more about bench research and contributing to nursing science.

Student Benefits. The RCEU experience working with nursing and biology faculty members will provide the undergraduate student an opportunity to learn about research development, ethics, and laboratory experimentation. The student will be directly involved in the design, development, and testing of disinfectants and monitoring microbial growth in blue bulb suction aspirators. The person will collect, enter, and analyze the data with the assistance of the faculty. The student is expected to present not only at the RCEU conference, but additional nursing and/or biology conferences as identified by the faculty mentor.

This RCEU experience provides a clear benefit of learning new techniques and being exposed to new environments that is over and above what is routinely provided in the nursing program. An outcome of this RCEU project is that the student will develop an abstract for submission to the Southern Nursing Research Conference fall 2015. The student will be involved in the development of the abstract, presentation, and a possible manuscript related to this research project.

Student Learning Outcomes

By the end of summer 2015, the student will

1. Develop a minimum of 10 different disinfectant agents using common commercial items found in a household such as isopropyl alcohol, bleach, and dish detergent.
2. Test the disinfectants on gram positive and gram negative bacteria, monitor, and record bacterial growth.
3. Identify ease of use of disinfectants in the blue bulb syringe.

Mentor Supervision and Interaction

The student will have weekly meetings with Dr. O'Neal and selected meetings with Dr. Joseph Leahy to discuss research progress and evaluate student developed learning outcomes. Dr. Leahy will oversee the student work in the lab. Dr. O'Neal will actively provide leadership and mentorship in seeking funding for travel to support scholarly dissemination of the work at selected conferences. Previous students under Dr. O'Neal's mentorship have acquired grant funding and have been invited speakers at conferences. The selected student who is interested in this study will make a difference in patient care practices and be involved in new protocol development.