

In Vivo-In Vitro Evaluation of Bacteria Aerosolization During Treatment with Acoustic Pressure Wound Therapy* for Infected Wounds

Kan Lam¹, Mike Peterson², Dinorah Ochoa¹, Ann Wang¹, Sisy Shi¹ and Paul Attar¹

¹ BRIDGE PTS (Preclinical Testing Services), San Antonio, Texas; ² Celleration Inc., Eden Prairie, Minnesota

Purpose

Acoustic pressure wound therapy (APWT)* delivers acoustic pressure waves to the wound bed via a gentle, sterile saline mist to remove slough, fibrin, tissue exudates, and bacteria.¹ This study was designed to determine whether treatment with APWT² results in hazardous levels of bacteria aerosolization into the treatment environment during treatment of infected wounds and what effect, if any, universal precautions would have on reducing or eliminating aerosolized microbial exposure.

Methods

Infected wounds on Yorkshire-cross pigs were treated using either APWT, sham spray (nebulizer compressor delivering kinetic energy and fluid flow equivalent to APWT), or moist control dressing.

Porcine Wound Model

- ❖ Twenty, full-thickness wounds (10 per side) 2-cm apart on the backs of 3 pigs
- ❖ Wounds inoculated with coagulase-negative staphylococci, *Fusobacterium* sp., and *Pseudomonas aeruginosa* and covered with occlusive layer for 15 minutes
- ❖ Resulting bioburden: $\approx 10^6$ bacteria/gram tissue

Test Treatments

APWT or sham spray (4 min) was administered every other day for 21 days. After each treatment, biopsies were taken and wounds were dressed with saline-moistened Telfa gauze. A blue absorbent pad was placed over the primary dressing.

	Pig 1	Pig 2	Pig 3
Left side:	APWT	Moist control	APWT
Right side:	Moist control	Sham spray	Sham spray

Results

No significant differences in number of microbial colonies between any treatment or control plates

Uncovered Plates	Wrapped Plates
Bacteria quantities never > 1.5 logs (26 CFU) for treatment or control	Bacteria quantities never > 1.2 logs (18 CFU) for treatment or control
No difference in bacteria quantities on uncovered vs wrapped plates (P=NS, all comparisons)	
Bacterial counts on majority of plates substantially < 1 log	

Aerosol Sampling Procedure

- ❖ During treatment, agar media sampling plates were placed in groups of 6 at 4 locations on the surgical table: left side, right side, in front across from pig, and near the exit door.
- ❖ Placement was intended to simulate locations of (1) the treating clinician, (2) the face of the treated patient, (3) another patient in the room, and (4) the exit doorway. See photos.
- ❖ At each location, one set of media plates was left uncovered and the other wrapped with sterile surgical masks to simulate universal precautions or personal protective equipment.

Agar Media Plates

Tryptic Soy Agar (dark yellow)
Determine total bacterial counts

Mannitol Salts Agar (red)
Determine number of staphylococci present

Pseudomonas Isolation Agar (pale yellow)
Determine number of *P. aeruginosa* present



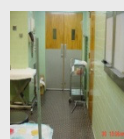
Clinician position



Patient's face position



Neighbor patient position



Doorway position

Microbiology Assessments

- ❖ Measurements were taken on Days 1, 3, 5, 7, 11, 13, 15, 17, and 19.
- ❖ After exposure (4 min), plates were incubated overnight at 37°C and the bacteria number was enumerated.
- ❖ Log median colony forming units (CFU) were calculated for each treatment exposure for uncovered and wrapped plates.

Conclusions

In an infected porcine wound model, neither APWT nor sham spray resulted in aerosolization of bacteria beyond background levels, indicating that APWT does not expose patients or clinicians to hazardous bacteria aerosols.

References

- Unger P. Low-frequency, noncontact, nonthermal ultrasound therapy: A review of the literature. *OstomyWound Manage.* 2008;54(1):57-60.
- Kent, DJ. Getting misty over wound care. Learn how therapy with ultrasound waves and saline mist can help your patient's wound heal. *Nursing.* 2007;37(9):36-37.

* MIST Therapy® System, Celleration Inc., Eden Prairie, Minnesota. Disclosures: This study was conducted by BRIDGE PTS using funds provided by Celleration. Mike Peterson is an employee, stockholder, and officer of Celleration. Funding for poster production was also provided by Celleration.