Determination of biofilm formation between different strains of *Propionibacterium acnes* using biofilm assay

*[1] Yusufu, W.N., [1] David, D.L., [1] Taiga, A. and [1]Akwa, V

[1]Department of Biological Sciences, Taraba State University, Jalingo, Nigeria

SUNDAY 5TH – THURSDAY 9TH AUGUST 2018

Introduction

- *Propionibacterium acnes (P. acnes)* is an aero tolerant, anaerobic, Gram- positive, pleomorphic rod.
- The virulence of *P. acnes* can be improved by its ability to adhere/attach to the human skin, leading to infections of deep tissue via bacteria seeding through surgical incisions, inadequate antiseptics or aseptic techniques (Gallo *et al.,* 2003; Grice *et al.,* 2009).
- A biofilm is a polysaccharide matrix or substratum holding bacteria cells in a particular metabolic state (Coneye *et al.,* 2007).
- In 2003, Ramage *et al.* (2003) showed that *P. acnes* have biofilm forming abilities and that planktonic *P. acnes* cells are less antibiotic resistant than sessile cells.

Objectives

- To determine the ability of different *P. acnes* strains to form biofilms.

Experimental Setting

- Completely Randomized Design (CRD) as described by Gomez and Gomez (1984) was used with three replication and data obtained were analyzed statistically by Analysis of Variance (ANOVA) according to Gomez and Gomez (1984).

Methodology

- Study Area
- Sample strains/ sites of samples

➢ *Rec A* types $1A_1$, 1B, II, III and acne lesion

➢Lumber disc herniation sites and acne vulgaris lesions

➢The isolates used were 71($1A_1$), 84($1A_1$), 17(IB), 82(IB), 24(II), 55(II), 1(III), 64(III), acne lesion 1, acne lesion 7 and NCTC 737.

- Overnight culture preparation
- Semi quantitative biofilm assay as described by Merritt *et al*. (2005) with some modifications.

Results and Discussion

- **Absorbance of samples**

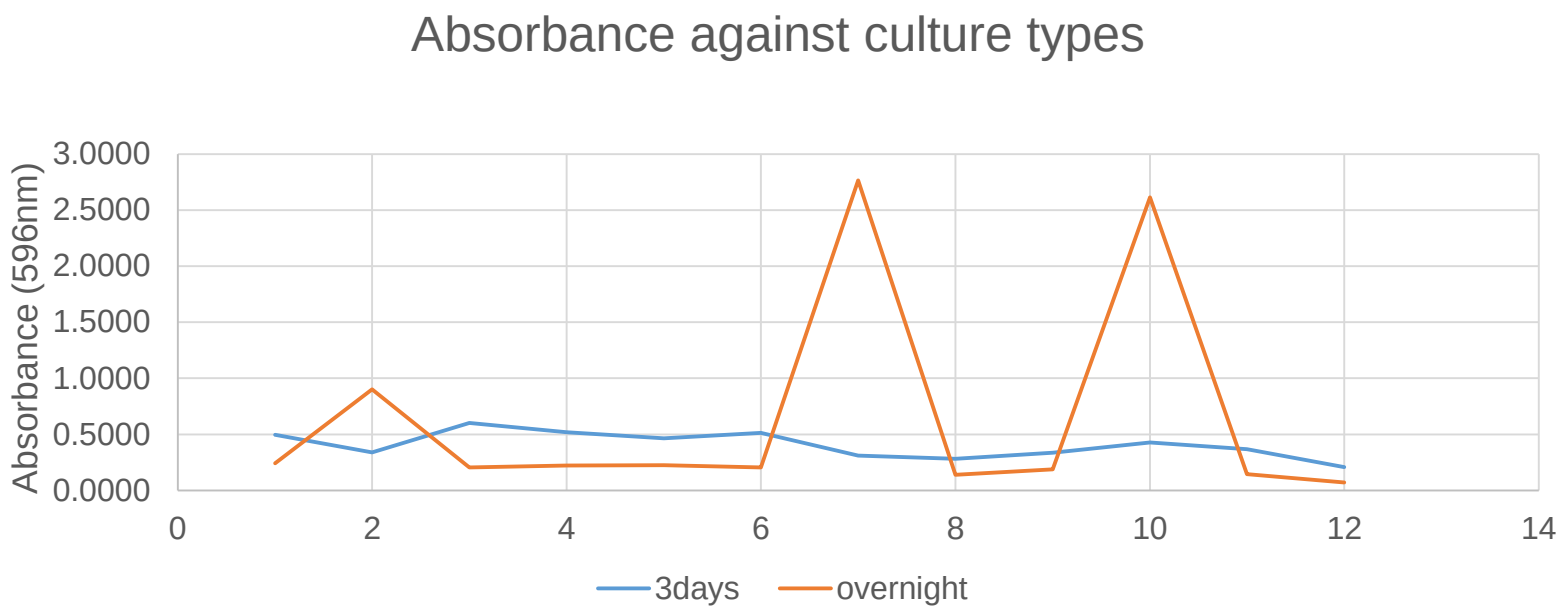
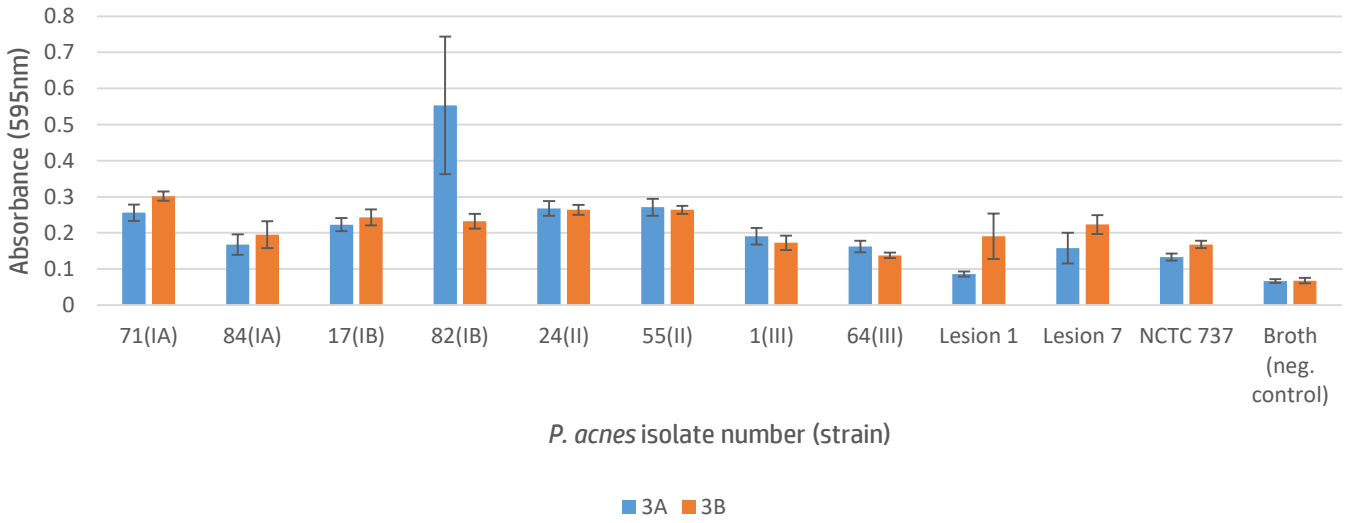


Figure 1: Comparing the biofilm forming ability between triplicates of *P. acnes* isolates from 3 days old culture to an overnight culture against their absorbance upon 4 day's incubation.

- Using ANOVA, *P. acnes* samples, P= 0.54599. P is greater than 0.05. For the biofilm test, P = 0.394056. P is also greater than 0.05. There is a significant difference.

Results and Discussion

- **Reproducibility of method**



- The same standardized *P. acnes* culture was used and inoculated on to two different microtiter plates, under the same conditions.
- It was observed that there was still a slight difference to the result
- Difference in the result shows method can not be 100% reproducible.

Conclusions & Recommendations

- *P. acnes* was able to form biofilms with all strains tested.
- Higher biofilm formation was witnessed upon use of the overnight culture.
- Both samples of lumber disc and acne vulgaris showed high biofilm forming abilities using overnight cultures. This implies the role of biofilm in both deep tissue infection and in acne vulgaris.
- Sample I(III) which using three nights cultures could be judged as a non biofilm producing strain had high biofilm formation using the overnight culture.
- The report of current study supports the hypothesis that biofilm plays a significant role in deep tissue infection.
- Trying to compare antibiotic resistance between strains of *P. acnes* and planktonic cell is on going.
- More work should be done to identify the role of biofilm formation in the pathogenesis of *P.acnes.*

References

- Coenye, T., Peeters, E. and Nelis, J. H. (2007). Biofilm formation by *Propionibacterium acnes* is associated with increased resistance to antimicrobial agents and increased production of putative virulence factors. *Research in Microbiology,* 158: 386-392.
- Gallo, J., Kolar, M., Novotny, R., Rihakova, P. and Ticha, V. (2003). Pathogenesis of prosthesis related infection. *Biomedical,* 147: 27–35.
- Gomez, K. A. and Gomez A. A. (1984). *Statistical procedures for Agricultural research*. 2nd Edition, John Wiley and sons, New York, Pp 680.
- Grice, E. A., Kong, H. H., Conlan, S., Deming, C. B., Davis, J., Young, A.C., Bouffard, G.G., Blakesley, R.W., Murray, P.R., Green, E.D., Turner, M.L. and Segre, J.A. (2009). Topographical and temporal diversity of the human skin microbiome. *Science,* 324: 1190–1192.
- Merritt, J. H., Kadouri, D. E. and O'Toole, G. (2005). Growing and analysing Static Biofilms. *Current Protocols in Microbiology,* 01 unit-1B.1.
- Ramage, G., Tunney, M. M., Patrick, S., Gorman, S. P. and Nixon, J.R (2003). Formation of *Propionibacterium acnes* biofilms on orthopaedic biomaterials and their susceptibility to antimicrobials. *Biomaterials,* 24: 3221–3227.

Acknowledgements

- The authors wish to acknowledge the contribution and support of Dr Jess Rollason for her tireless support throughout the period of this research and to Sue Thompson and her team of laboratory technicians in the Microbiology laboratory (JS 114) for all their instructions and direction throughout the period of this research.

Acknowledgements

- The authors wish to acknowledge the overwhelming support from the Taraba State University, Jalingo for this great opportunity to attend this 31st Annual conference for the Biotechnolgy Society of Nigeria.