

EFFICACY OF NVC-422

AGAINST *Staphylococcus aureus* BIOFILMS IN A SHEEP MODEL OF SINUSITIS

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NVC-422 developed by NovaBay Pharmaceuticals, Inc.

Study funded by NovaBay Pharmaceuticals, Inc.

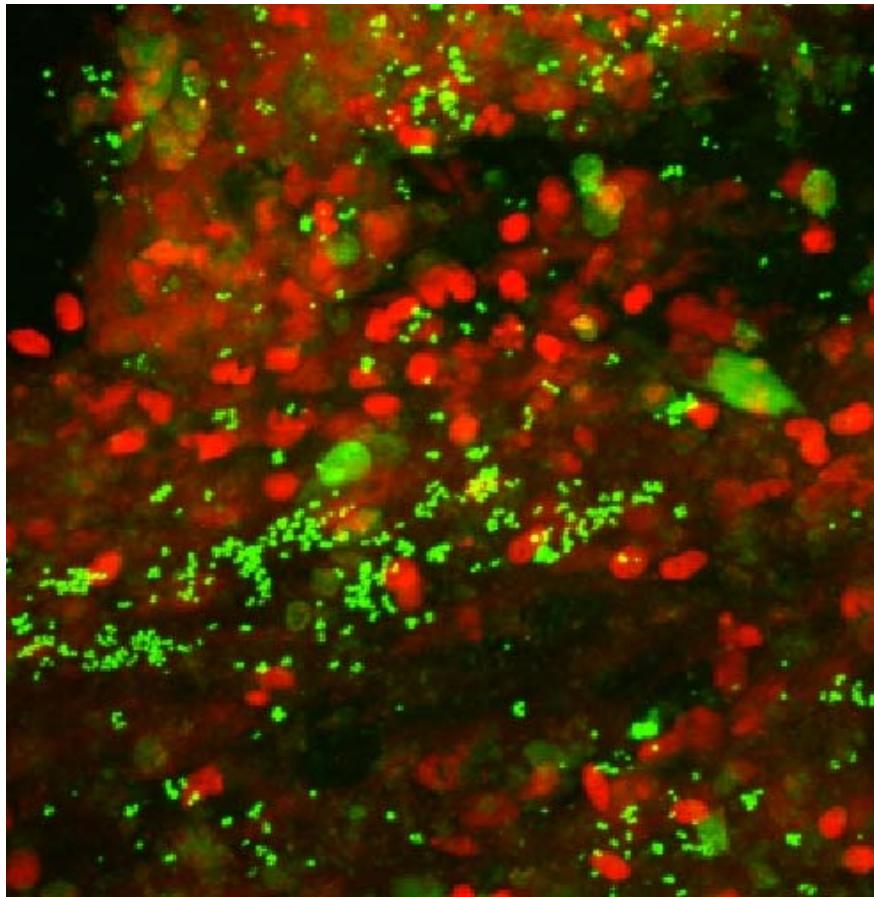


^a: Department of Otolaryngology Head & Neck Surgery, University of Adelaide, Australia

^b: NovaBay Pharmaceuticals, Inc., Emeryville, California



BIOFILMS...



Mupirocin

- *Laryngoscope* 118(9) 1677-80
- *Laryngoscope* 118(3), 535-540
- *AJR* 22(6), 560-67

Macrolide antibiotics

AJR 21(2), 149-153

Baby shampoo

AJR 22(1), 34-37

CAZS

- *AJRA* 23(6), 597-601
- *AJR* 22(6), 560-67
- *AJR* 21(5), 527-532

Honey

OHNS 141 (1), 114-118

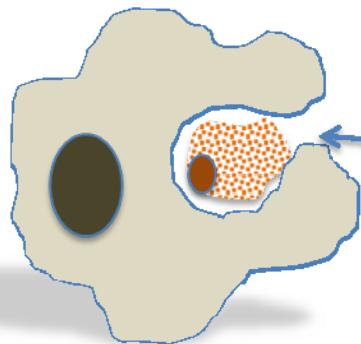
Ultrasound

Medical Hypotheses, 73(1), 15-17

Laser

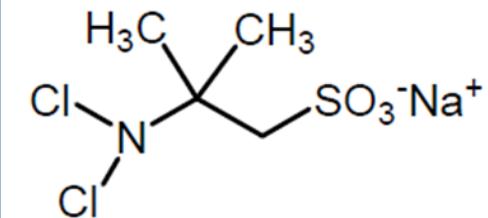
- *AIP Conference Proceedings* 1142
- *Laryngoscope* 119 suppl 1, 42

NVC-422....



N-chlorotaurine

NovaBay[®]
PHARMA

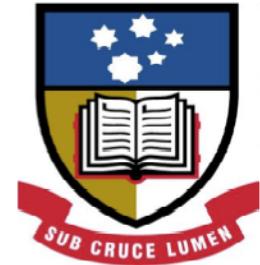


- **Fast-acting, potent, broad-spectrum**
1
 - *S. aureus*, MRSA, *Streptococcus spp.*, *E. coli*, *C. albicans*, adenovirus, HSV etc ...

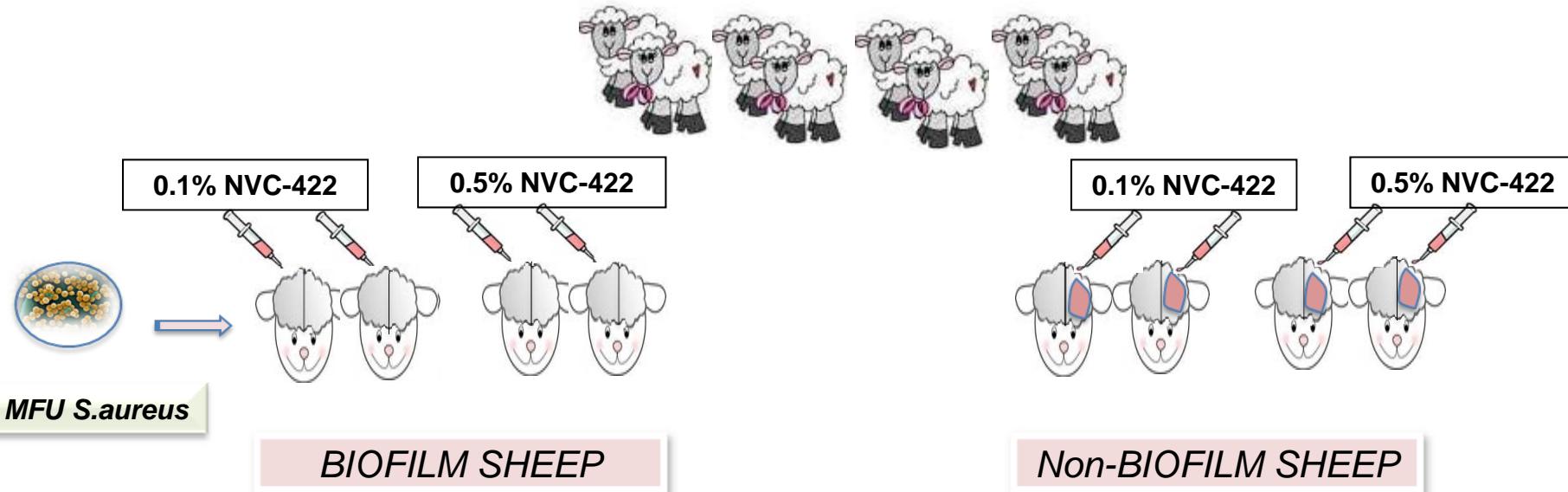
Aim: Assess safety & efficacy of NVC-422 in the sheep model ² of biofilm associated sinusitis.



2. Ha, K.R. et al, American Journal of Rhinology, 2007, 21(3), p. 339-345.
1. Wang, L. et al, Antimicrob Agents Chemother., 2011 Mar; 21.



SAFETY STUDY RESULTS...



Outcome Measures

General Sheep condition

➢ General Sheep condition

~~Biofilm sheep~~

~~0.1% NVC-422~~

~~change in appetite/thirst~~

~~0.5% NVC-422~~



➢ ~~pathology of sinu~~ osa

Non-Biofilm sheep

~~0.1% NVC-422~~

~~raised temperatures~~

~~0.5% NVC-422~~



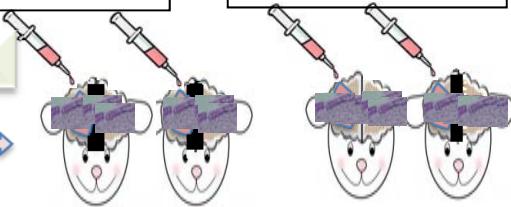
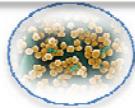
SAFETY STUDY RESULTS...

BIOFILM SHEEP

0.1% NVC-422

0.5% NVC-422

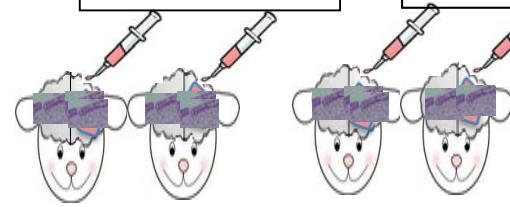
0.5 MFU *S.aureus*



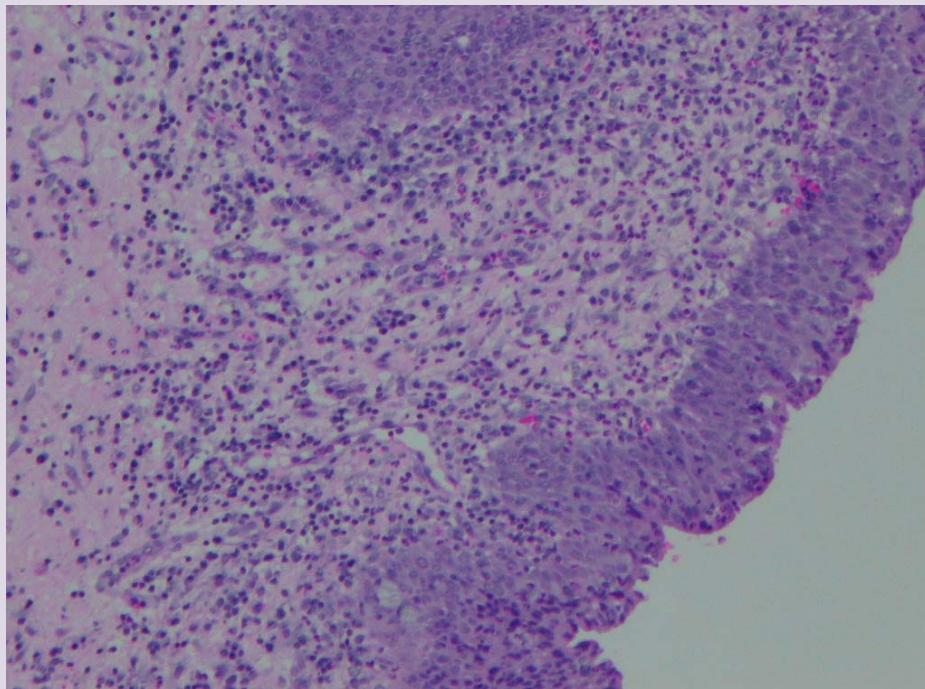
Non-BIOFILM SHEEP

0.1% NVC-422

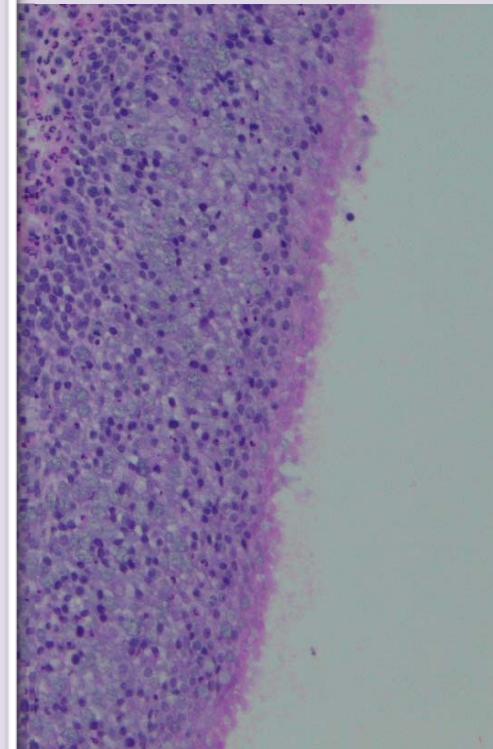
0.5% NVC-422



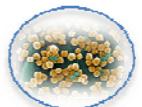
Biofilm-treated sinuses



Treated sinuses

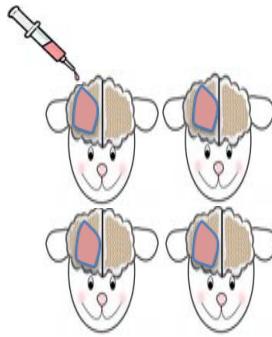


EFFICACY STUDY PROTOCOL ...

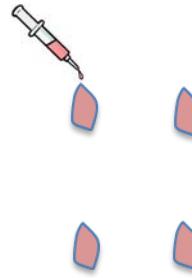


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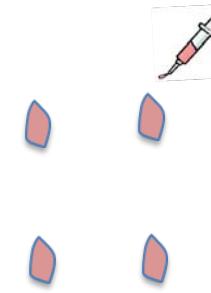
0.5 MFU *S.aureus*



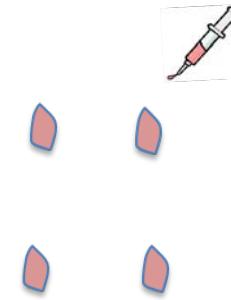
0.1% NVC-422



0.5% NVC-422



NVC-422 vehicle solution



Normal saline

Outcome Measure: Change in biomass of biofilm after treatment.

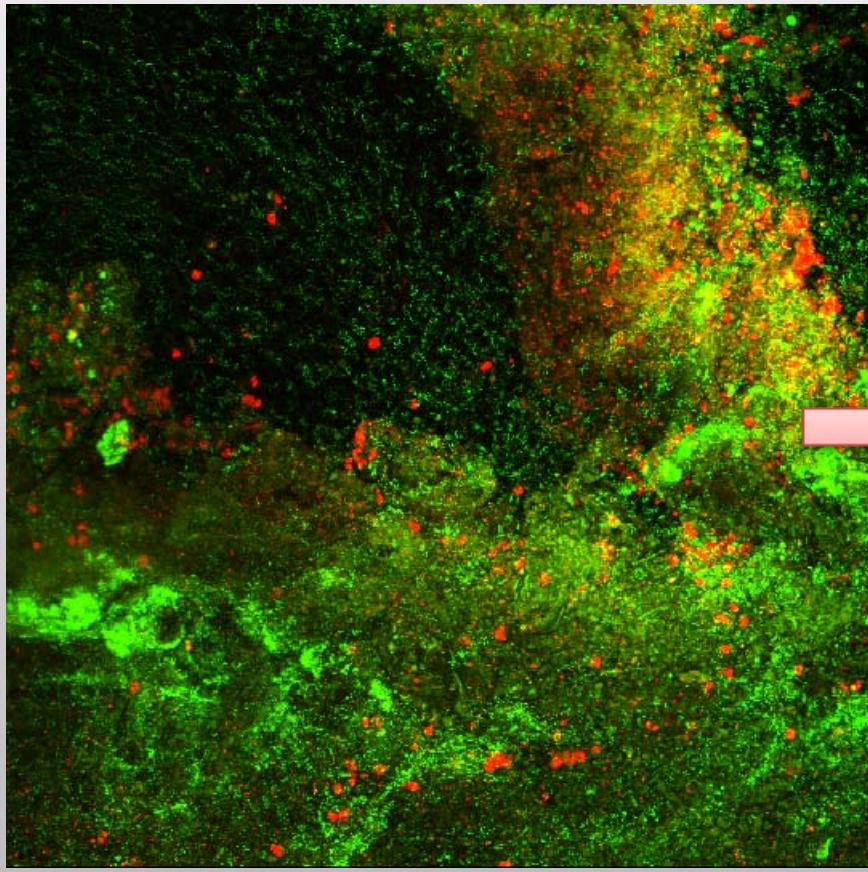


**Adelaide
Rhinology**

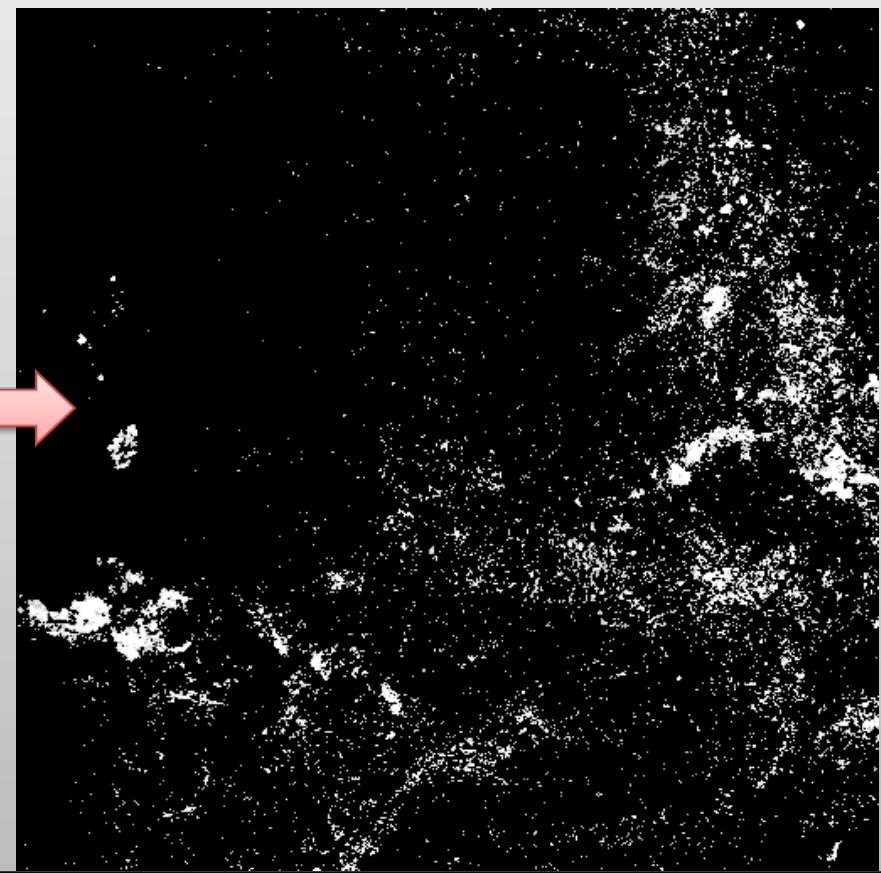


BIOFILM IMAGING & ANALYSIS...

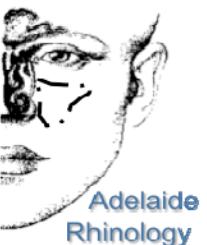
Live-Dead BacLight stain-CSLM protocol⁴



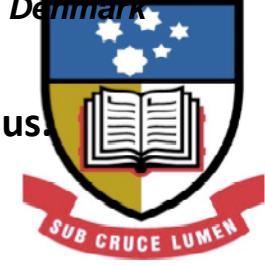
COMSTAT2 software⁵, :Biofilm biomass
(volume/area or $\mu\text{m}^3/\mu\text{m}^2$)



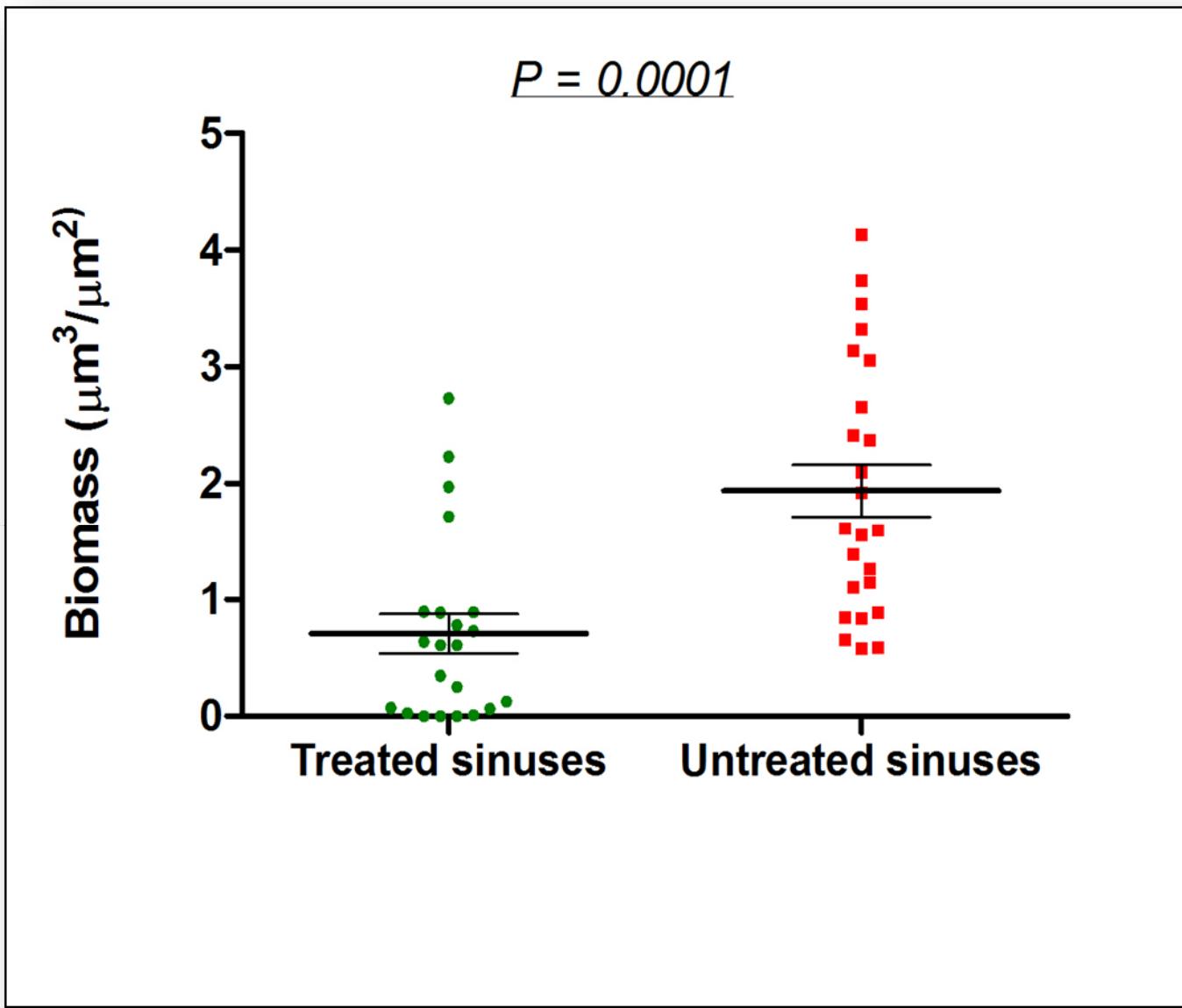
5. <http://www.COMSTAT2.dk>, Lyngby, Denmark



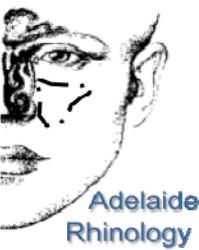
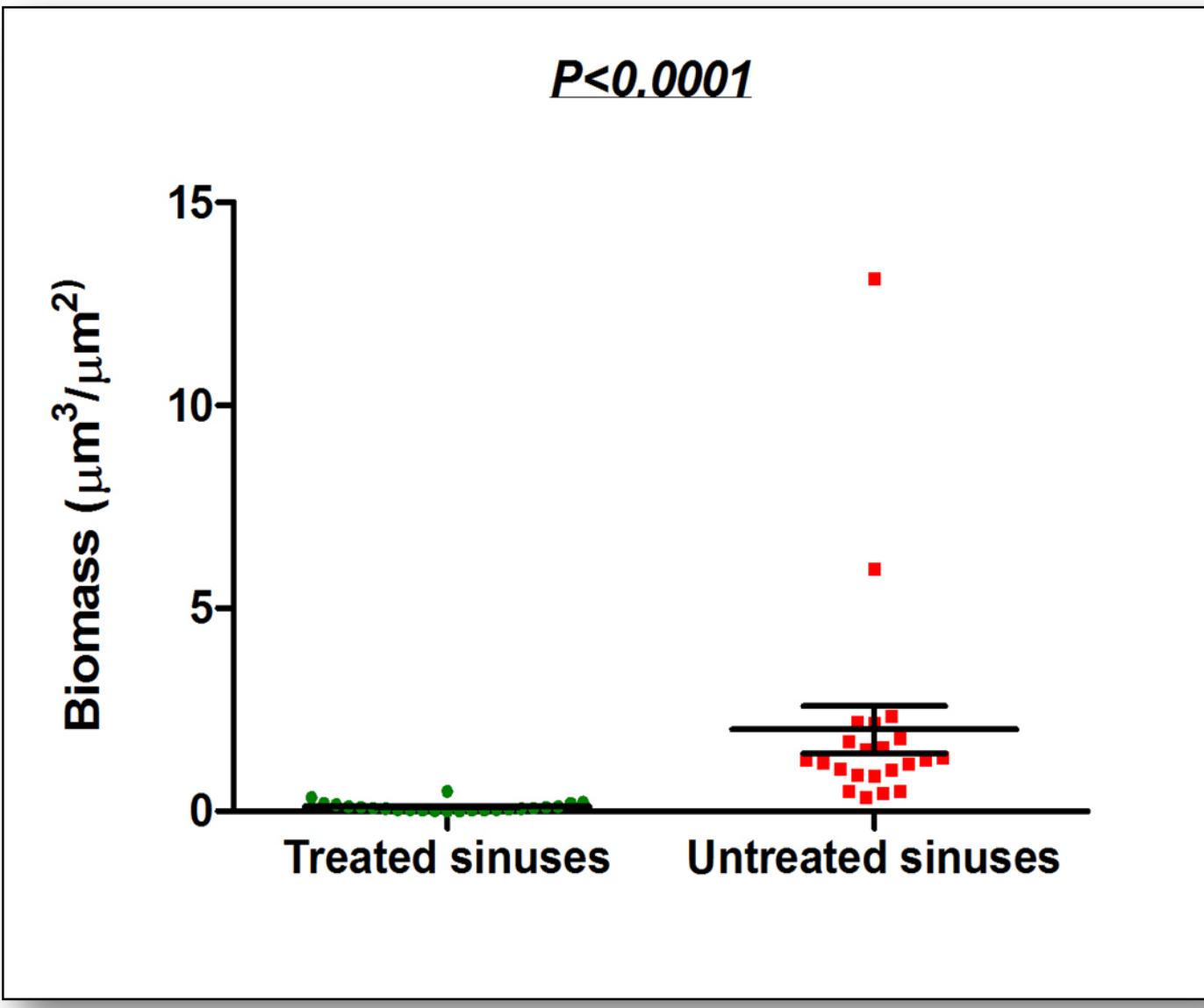
- 2 random image-stacks from 2 mucosal samples from each sinus - 4 stacks/sinus.
 - Each stack (20x): volume $5.1 \times 10^7 \mu\text{m}^3$ of tissue / image stack.



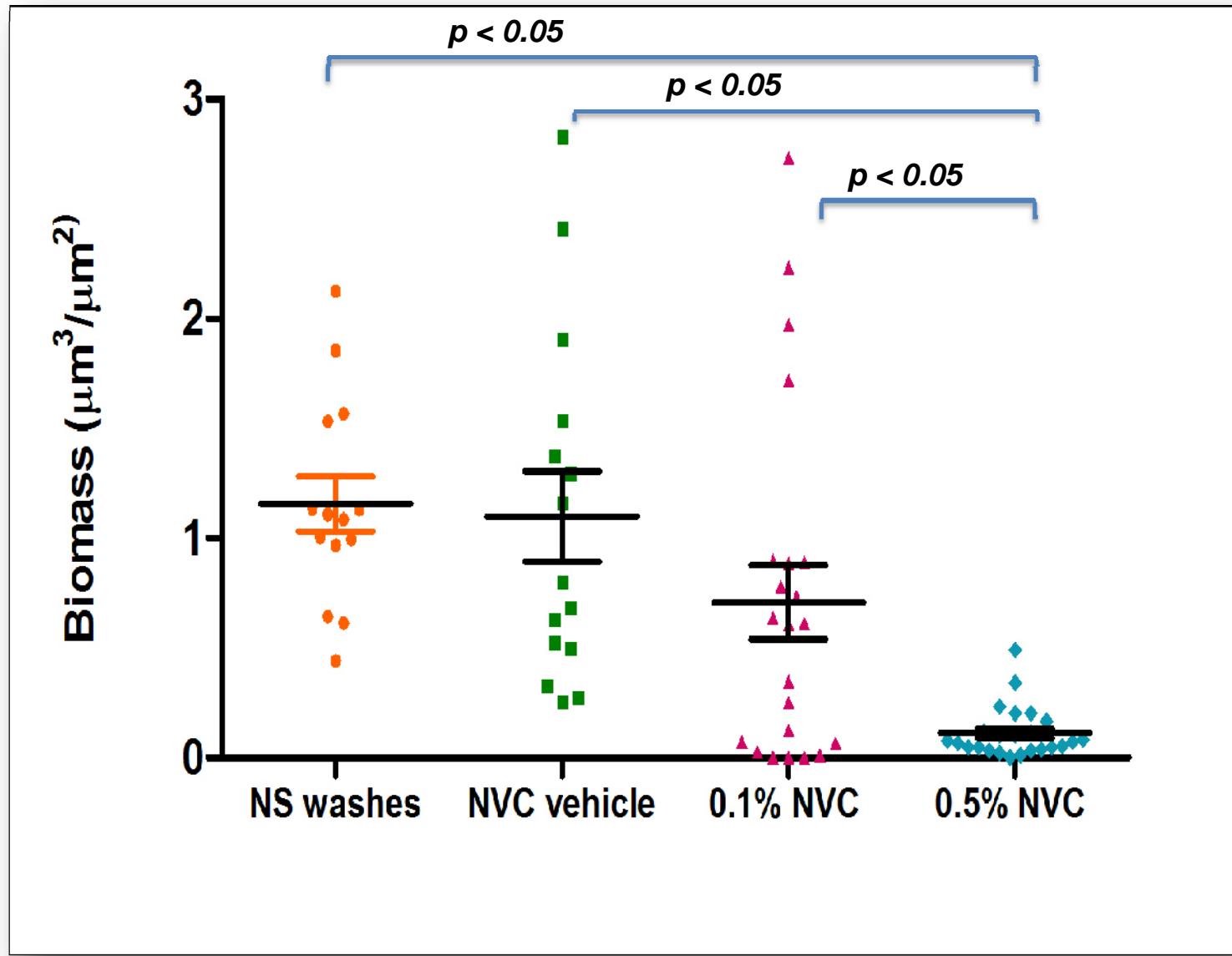
EFFICACY OF 0.1% NVC-422



EFFICACY OF 0.5% NVC-422



MEAN BIOMASS COMPARISION OF TREATMENTS



CONCLUSIONS....

- 0.1% & 0.5% NVC-422 nasal irrigation effectively reduces *S. aureus* biofilm biomass *in vivo*.
- NVC-422 more consistent & efficacious at higher concentrations of 0.5% solutions
- Patchy mucosal changes after NVC-422 irrigation – ?transient change

ACKNOWLEDGEMENTS

- **NovaBay Pharmaceuticals, USA**
- **The Queen Elizabeth Hospital Surgical Workshop Facility, Adelaide**
- **Adelaide Microscopy, Medical School, Adelaide**
- **Basil Hetzel Institute, Adelaide.**