EFFICACY OF NVC-422 AGAINST Staphylococcus aureus BIOFILMS IN A SHEEP MODEL OF SINUSITIS

Deepti Singhal\textsuperscript{a}, Andreas Jekle\textsuperscript{b}, Dmitri Debabov\textsuperscript{b}, Lu Wang\textsuperscript{b}, Bez Khosrovi\textsuperscript{b}, Mark Anderson\textsuperscript{b}, Andrew Foreman\textsuperscript{a}, PJ Wormald\textsuperscript{a}

NVC-422 developed by NovaBay Pharmaceuticals, Inc.

Study funded by NovaBay Pharmaceuticals, Inc.

\textsuperscript{a}: Department of Otolaryngology Head & Neck Surgery, University of Adelaide, Australia
\textsuperscript{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**

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

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

---

Outcome Measures

- General Sheep condition
  - Change in appetite / thirst, abnormal posturing, raised temperatures

Biofilm sheep

- 0.1% NVC-422
- 0.5% NVC-422

Non-Biofilm sheep

- 0.1% NVC-422
- 0.5% NVC-422

- Histopathology of sinus mucosa

0.5 MFU S. aureus

SAFETY STUDY RESULTS...
SAFETY STUDY RESULTS...

**BIOFILM SHEEP**

- 0.1% NVC-422
- 0.5% NVC-422

**Non-BIOFILM SHEEP**

- 0.1% NVC-422
- 0.5% NVC-422

0.5 MFU S.aureus

**Biofilm-treated sinuses**

**Non-biofilm untreated sinuses**

**Biofilm-untreated sinuses**

**Non-biofilm treated sinuses**
Outcome Measure: Change in biomass of biofilm after treatment.
BIOFILM IMAGING & ANALYSIS...

Live-Dead Baclight stain-CSLM protocol

COMSTAT2 software: Biofilm biomass (volume/area or μm³/μm²)

- 2 random image-stacks from 2 mucosal samples from each sinus - 4 stacks/sinus
- Each stack (20x): volume 5.1 x 10⁷ μm³ of tissue / image stack.

5. http://www.COMSTAT2.dk, Lyngby, Denmark
EFFICACY OF 0.1% NVC-422

\[ P = 0.0001 \]

**Biomass (\(\mu m^3/\mu m^2\))**

- Treated sinuses
- Untreated sinuses

[Graph showing data points and comparison between treated and untreated sinuses with statistical significance indicated.]
EFFICACY OF 0.5% NVC-422

\[ P < 0.0001 \]

Biomass (\( \mu m^3/\mu m^2 \))

Treated sinuses vs. Untreated sinuses
MEAN BIOMASS COMPARISON OF TREATMENTS

![Graph showing mean biomass comparison of treatments with p < 0.05 for all comparisons.](image-url)
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.