

Topical Nasal Therapies: What do we know?

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Topical Therapies

- Conventional
 - TSS
 - TAH
 - Saline washes
 - Steroid rinses
- Less Conventional
- Unconventional

Topical Therapies

- Conventional
- Less Conventional
- Unconventional
 - Olive leaf extract
 - Elderberry extract

Unconventional

- Olive leaf extract
- Elderberry extract
- ???
- ???

**NO
DATA**

Topical Therapies

- Conventional
- Less Conventional
- Unconventional

Topical Therapies

- Conventional
- Less Conventional
 - Povidone Iodine
 - Colloidal Silver
 - Xylitol
- Unconventional

Povidone Iodine

- Complex of iodine and polyvinylpyrrolidone (PVP-I), aka betadine
- Microcidal – bacteria, viruses, fungi, biofilms
- Penetrates organisms oxidizes proteins, nucleotides and kills cell

Povidone Iodine

- Free iodine released from PVP-I oxidizes cysteine and methionine, interferes with enzyme activity
 - Anti-proteinase effect
- IL-33 key factor in Th2 inflammation
 - Cleaved IL-33 more active than full length
- AR sensitized mice treated with PVP-I 0.1% saline rinses
 - Reduced sneezes, nose rubs
 - Suppressed production of IL-33, IL-5 and IL-13
 - Significantly lower eosinophils, goblet cells
 - Significantly lower cytokines

Povidone Iodine

- Nasodine (0.05% povidone iodine)
- In vitro ALI model
- No cellular toxicity at 30 minutes
- No impact on CBF
- Clears from nasal cavity within 2-15 mins

Povidone Iodine

- PVP-I of 5% or greater were ciliotoxic
- PVP-I of 1.25% not ciliotoxic
- PVP-I of 0.01% lower limit of potency

Povidone Iodine

- 0.5% PVP-I
- *S. aureus* biofilms in vitro
- 5 min – 0.6 log₁₀ reduction
- 30 min – 1.2 log₁₀ reduction
- 60 min – 3.8 log₁₀ reduction
- 6 hour – near-complete eradication

Laryngoscope, 133:2490–2495, 2023

Povidone Iodine

- 62 patients, post-ESS, gram+ exacerbations
- 1% PVP-I solution vs saline
- BID x 30 days
- Well tolerated
- No change in post-treatment culture negative rate vs Saline

Povidone Iodine

- 55 patients randomized to PVP-I 0.1% or saline starting 1 week post ESS
- No significant differences in SNOT-22, endoscopic scores at 1 month, 3 months post op.

Povidone Iodine

- PVP-I 0.08%
 - 2mL of commercially available 10% aqueous PVP-I into 240 mL of saline.
- Rinse each side QOD x 7 weeks
- 29 patients
 - 4 withdrew due to headache, sinus pain
- Significant reduction in MLK discharge score
- 73% lowered SNOT-22 score, 38% achieved MCID on SNOT-22
- Nonsignificant: TSH increase, saccharin clearance, and olfaction

Colloidal Silver

- Colloidal silver
- Silver nanoparticles in a liquid base
- Used for centuries
- Most of the efficacy/safety data is anecdotal
- Created by running direct or alternating current through silver electrodes in water

Colloidal Silver

- Absorption, tissue processing, bioavailability studied but no consensus re dosing, exposure and safety
- Limited data on quality control, dosing, or toxicity
- AgNPs release silver ions easily, more biologically active and more potential for side effects

Colloidal Silver

- Believed to produce their antimicrobial effects by denaturing bacterial proteins, affecting the bacterial cell and cell membrane
- 2004 – in vitro tests with concentrations as high as 413 ppm – no antimicrobial activity against many bacteria

Colloidal Silver

- Argyria – discoloration of the eyes/skin from silver ingestion
- Requires ingestion, nasal or IV routes
- EPA: silver limits in drinking water 50 ppb
- Many products are 50 ppm
- OSHA: permissible exposure of all forms 0.01 mg/m³

Colloidal Silver

- Goggin et al
- Staph aureus biofilms
- 20mcL – 150mcL of 33 ppm CS
- All showed between 98.9 and 99.8% reduction in biofilm presence

Colloidal Silver

- Feizi et al
- Green Synthesized Colloidal Silver
 - Novel production process
 - Excellent in vitro efficacy, no cytotoxicity
- 2-hour exposure of 175 ppm GSCS to ALI epithelial cells
 - Nasal transit time about 15 minutes
- No significant impact on:
 - Cellular permeability
 - Cell viability
 - Ciliary Beat Frequency
 - Morphology, cilia structure, tight junctions

Colloidal Silver

- Rajiv et al
- Frontal sinusitis induced in sheep
- Treated with varying doses of CS
- 30 ppm, 20 ppm, 10 ppm, 5 ppm, controls
- Blood silver levels significantly higher in treated sheep
- No differences in blood counts, kidney or liver functions
- Significant reduction in biofilm biomass in treated sheep

Colloidal Silver

- Scott et al, 2017
- 20 patients 10 ppm CS spray or saline for 6 weeks, then crossed-over to alternative spray
- No significant difference between two groups for SNOT-22 or Lund-Kennedy endoscopic scores
- No difference between baseline scores and 12 week scores
- No serious adverse events

Colloidal Silver

- Ooi et al 2018
- 22 post ESS patients, oral antibiotics or CS rinses
 - Prospective, non-randomized
- No significant difference between the groups
- 4 of 11 had transient serum silver level increase
- No significant change in PROMs

Xylitol

- 5-carbon sugar alcohol
- Naturally found in some fruits
 - Enriched as a sweetener (gum, candy)
- No intrinsic antibacterial properties, but stimulates the innate immunity
- Creates uninhabitable environment, preventing bacteria from adhering to tissue

Xylitol

- May lower airway surface liquid salt concentration, enhancing innate immunity
- DBRCT healthy volunteers
 - Xylitol nasal spray for 4 days decreased Staph colonies significantly more than saline

Xylitol

- Weissman et al 2011
- Prospective, double blinded, controlled, cross-over study
- Daily Xylitol (10mg per wash) vs saline irrigations
 - 10 days each, 3 days between arms
 - 15 patients, SNOT-20, VAS
- Xylitol showed improved SNOT-20
 - Not clinically meaningful change

Xylitol

- Kim et al, 2019, DBRCT evaluating saline vs xylitol washes
 - 4mg xylitol per wash
- Patients underwent ESS, septoplasty, or both
 - 2 weeks of wash A TID, 7 day washout
 - 2 weeks of wash B TID
- Post ESS: Xylitol showed significant improvement in SNOT-20, VAS sneezing, headache, facial pain compared to saline
- Lund-Kennedy showed no difference.
- Post septoplasty: No difference in SNOT 20 or NOSE between groups. VAS nasal stuffiness improved in xylitol group
- Combo surgery: no significant differences between groups

Xylitol

- Xylitol is a prothrombotic and associated with cardiovascular risk
 - European Heart Journal 2024
- 30g Xylitol ingested
 - 30 mins: 1000 fold plasma levels noted
 - Normal 4-6 hours later
 - Post prandial Xylitol levels enhanced platelet reactivity
 - Accelerated the rate of platelet adhesion
 - When levels simulated in mice: Increased clot formation

Conclusion

- Dearth of data on many non-conventional topical nasal preparations
- Povidone Iodine sinus rinses may be an option for biofilms
- Colloidal Silver may be an option for biofilms but more data needed
- No data to suggest CS spray of any benefit
- Xylitol can be used as an alternative to NaCl