RESEARCH BRIEF

Zinpro® Zinc Lysine Glutamate Preserves Airway Ciliary Function During Alcohol Exposure

Study Objective

Evaluate whether Zinpro® Zinc Lysine Glutamate (ZnLG) protects airway epithelial cells from alcohol-induced ciliary dysfunction (AICD) and preserves signaling pathways required for normal ciliary function.

Study Duration

In vitro airway epithelial cell model

- 1-h ZnLG pretreatment
- 24-h alcohol exposure
- 1-h ciliostimulatory agent exposure

Researchers assessed ciliary function after alcohol exposure to determine whether ZnLG preserved normal responsiveness.

Experimental Models

Human and mouse airway epithelial cell models:

- Primary mouse tracheal epithelial cells
- Human bronchial epithelial cells
- Ex vivo mouse trachea particle transport model

Treatments

- 24 h + Media + 1 h = untreated Control
- Media + 8Br-cAMP = stimulated Control
- EtOH + 8Br-cAMP = alcohol damaged cells
- ZnLG + EtOH+8Br-cAMP = Zn-pretreated alcohol-exposed cells

Mechanism Evaluated

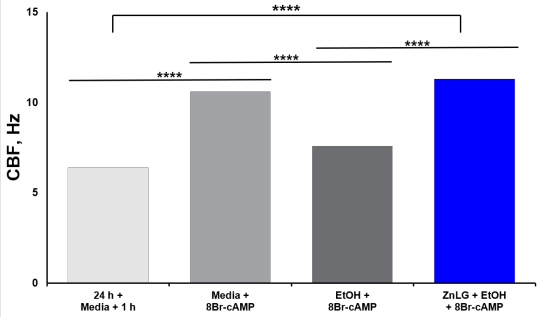
AICD occurs when prolonged alcohol exposure activates protein phosphatase 1 (PP1), which suppresses protein kinase A (PKA) signaling and reduces ciliary responsiveness. ZnLG was evaluated for its ability to interrupt this pathway and preserve normal ciliary function.

- Ciliary beat frequency (CBF)
- PKA activity
- PP1 activity
- Particle clearance assays

Key Findings

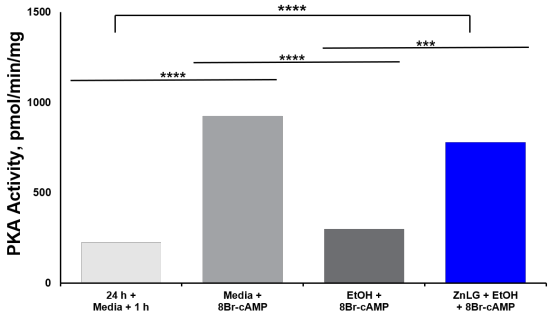
- Chronic alcohol exposure impaired ciliary responsiveness and reduced mucociliary clearance
- ZnLG restored cAMP-stimulated CBF following alcohol exposure
- ZnLG restored alcohol-suppressed PKA activity in mouse and human airway epithelial cells
- ZnLG prevented alcohol-induced activation of PP1, a key mediator of alcohol-induced ciliary dysfunction

Figure 1. Ciliary Beat Frequency



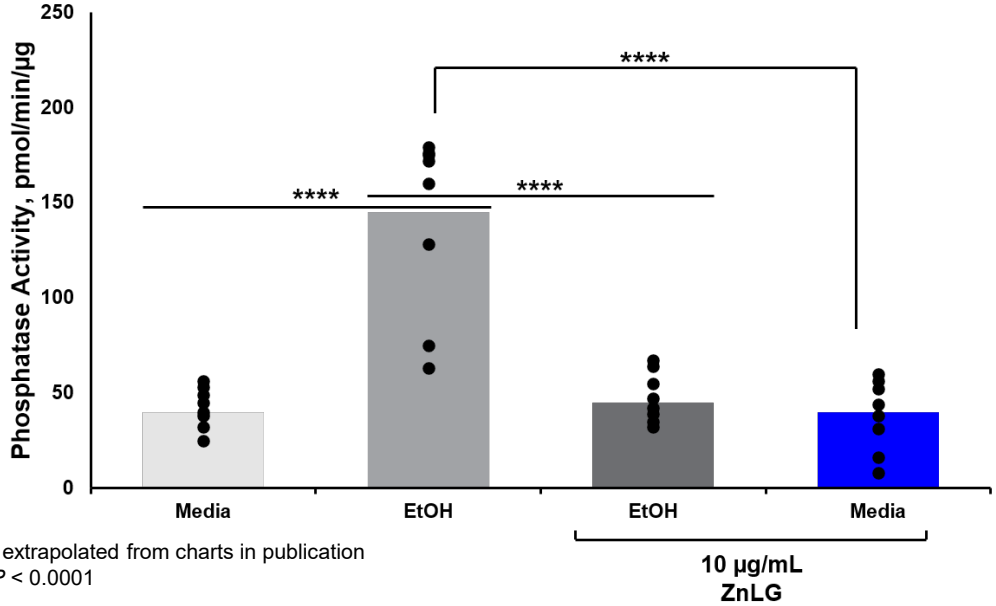
Data extrapolated from charts in publication
**** $P < 0.0001$

Figure 2. Protein Kinase Activity



Data extrapolated from charts in publication
*** $P < 0.01$; **** $P < 0.001$

Figure 3. Protein Phosphatase 1 Activity



Data extrapolated from charts in publication
**** $P < 0.0001$

Source: Do et al., 2026. Biology 15:1222 doi:10.3390/biology15151222

Implication

Alcohol exposure impairs airway defense mechanisms by disrupting signaling pathways required for normal ciliary function. Zinpro ZnLG restored ciliary responsiveness and prevented alcohol-induced PP1 activation, suggesting a potential role for zinc lysine glutamate in supporting mucociliary clearance under conditions associated with alcohol-induced dysfunction.

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