RESEARCH BRIEF

Zinpro® Zinc Lysine Glutamate Preserves Function of Airway Cilia Exposed to Organic Dust

Study Objectives

To evaluate the ability of Zinpro® Zinc lysine glutamate (ZnLG) to protect airway epithelial function during organic dust exposure by preserving ciliary motion and regulating signaling pathways involved in mucociliary defense.

Experiment 1: Ciliary Beat Frequency

Does Zinpro ZnLG preserve airway function during a dust challenge?

In airways, cilia beat back and forth to move mucus, dust and bacteria out of the lungs. This natural defense system is weakened when cilia slow down.

This experiment exposed *in vitro* airway epithelial cells to 5% organic dust extract (ODE) and then measured the frequency of cilia movement in response to 4 levels of ZnLG: 0, 50, 500 and 1000 ng/mL.

Experiment 2: Protein Kinase C Epsilon

How does Zinpro ZnLG prevent ciliary slowing?

The signaling enzyme PKCε activates when cilia slow down. PKCε is upregulated by dust and downregulated by zinc.

This experiment exposed *in vitro* airway epithelial cells to 5% organic dust extract (ODE) and ZnLG. The activity of PKCε was measured inside cells for the combinations of dust exposure and ZnLG treatment:

- ODE / - ZnLG
- ODE / + ZnLG
+ ODE / - ZnLG
+ ODE / + ZnLG

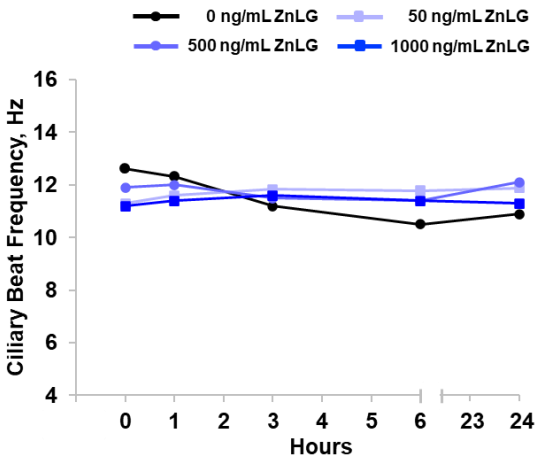
Location

University of Nebraska Medical Center
Nebraska, USA

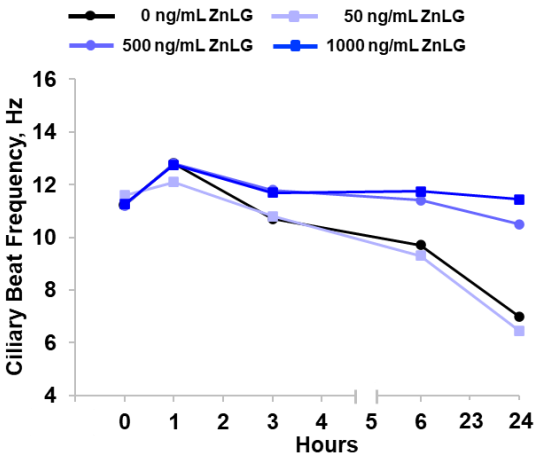
Key Results

- Airway epithelial cells exposed to Zinpro ZnLG but not ODE had no change in baseline ciliary beat frequency, indicating no effect of Zinpro ZnLG on normal ciliary function.
- Exposure to 5% ODE resulted in progressive slowing of ciliary beat frequency over time; 500 to 1000 ng/mL Zn from Zinpro ZnLG prevented dust-induced cilia slowing and maintained ciliary beat frequency near baseline levels during organic dust exposure.
- Zinpro ZnLG suppresses dust-induced PKCε activation, a signaling pathway associated with cilia slowing; While dust exposure increases PKCε activity over time, Zinpro ZnLG lowers PKCε activity at peak signaling.

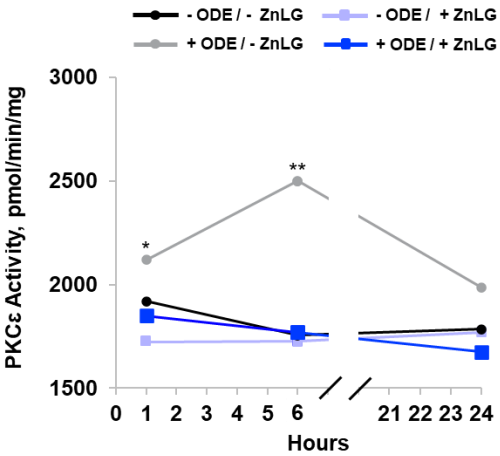
Exp. 1: Zinpro ZnLG Does Not Alter Baseline Ciliary Function (No ODE)



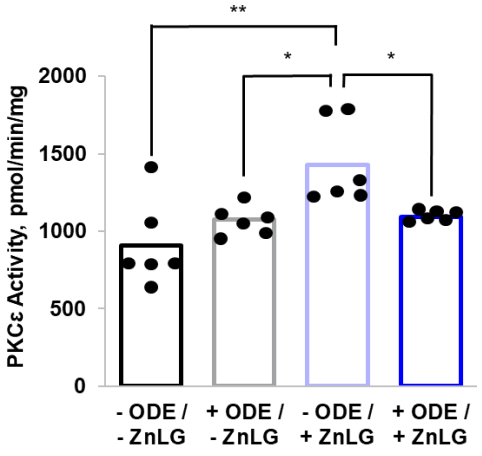
Exp. 1: Zinpro ZnLG Preserves Ciliary Function During Dust Exposure (+ 5% ODE)



Exp. 2: Zinpro ZnLG Suppresses Dust-Induced PKCε Activity Over Time



Exp. 2: Zinpro ZnLG Lowers PKCε Activity At Peak Activation



Implication

Preservation of airway ciliary function through PKCε suppression highlights a potential role for Zinpro Zn lysine glutamate in supporting mucociliary defense during environmental dust exposure.

Source: Bauer *et al*., 2024. Biomolecules 14(7), 843. https://doi.org/10.3390/biom14070843