

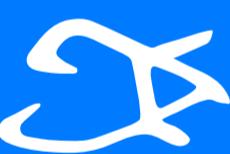
# DIAGNOSTIC OPTIMIZATION & CHEMICAL TREATMENT OF RHINOSINUSITIS

DO YOU  
REALLY KNOW  
RHINO-SINUSITIS?  
你真的了解  
鼻窦炎吗?

上海科技大学  
ShanghaiTech University  
DOCTOR  
iGEM 2025  
ShanghaiTech  
鼻窦炎的诊断和治疗



上海科技大学  
ShanghaiTech University

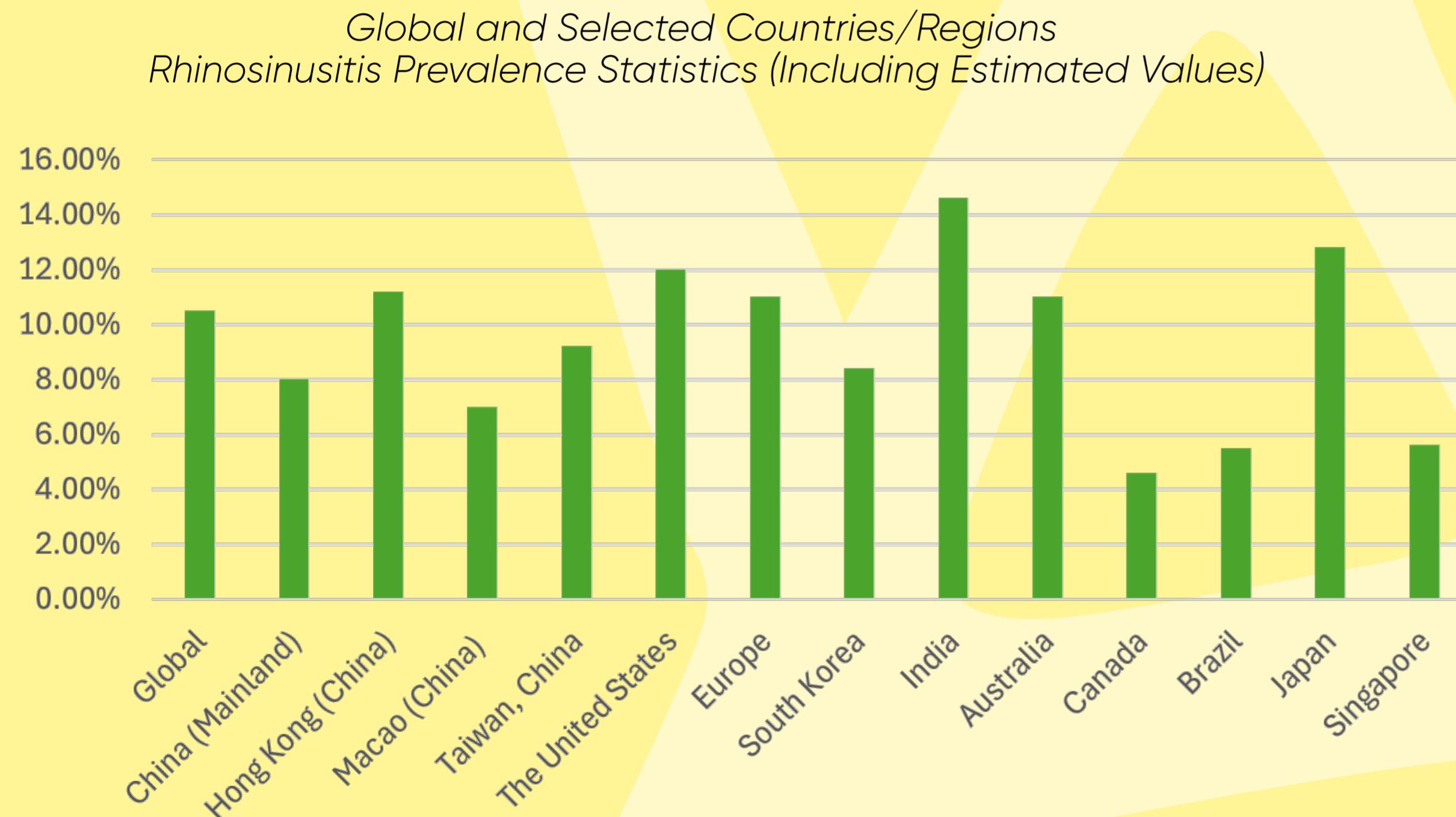


DOCTOR  
iGEM 2025  
ShanghaiTech



# RHINOSINUSITIS – A Neglected DISEASE

Have you or someone around you ever experienced persistent nasal congestion, purulent nasal discharge, or debilitating facial pain and headaches, only to dismiss it as a "bad cold" or "rhinitis"? You are not alone!



Worldwide, over 10% of adults suffer from chronic sinusitis. In China, the prevalence is as high as 8%, representing over 100 million people living with this condition. Sinusitis can severely affect sleep and concentration, reduce work efficiency, and impose a heavy economic burden.

# How to Tell If It's Sinusitis?

RHINITIS

SINUSITIS

## The Common Confusion

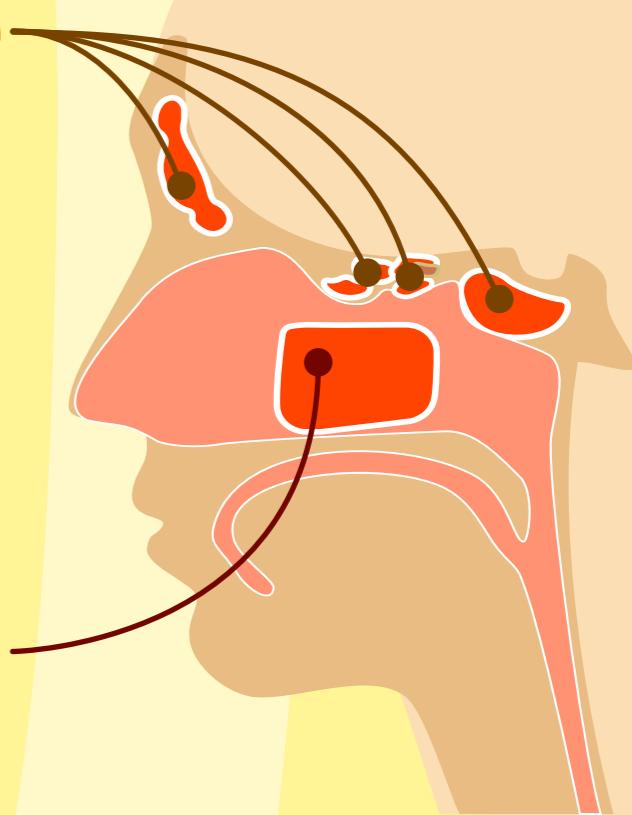
### Key Symptom Comparison

- # sneezing
- # nasal itchiness
- # intermittent congestion

- # headache
- # persistent severe congestion
- # purulent discharge
- # reduced sense of smell

Corresponding site

Corresponding site



### Stuffy Nose?

Don't Mistake Sinusitis for Rhinitis!

Rhinitis and sinusitis occur in different locations:

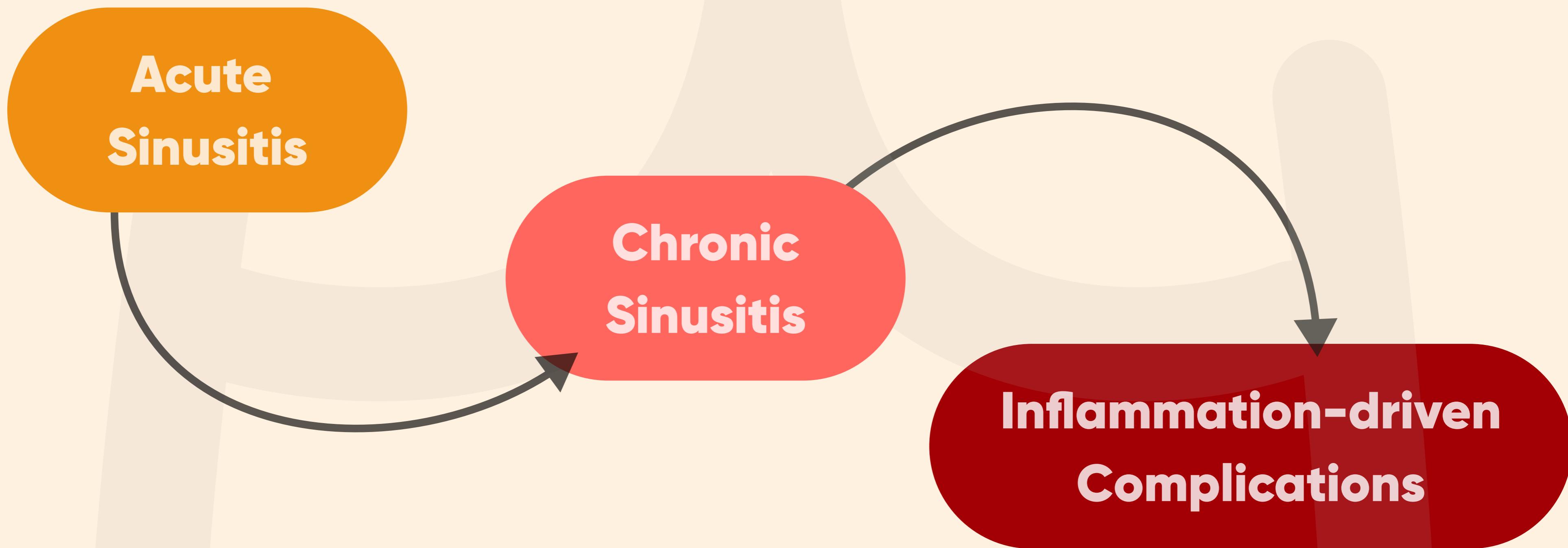
Rhinitis: Inflammation of the nasal mucosa.

Sinusitis: Inflammation of the sinus cavities.

# The Cost of Neglect

**Don't Ignore It !**

**Small Inflammation, Big Problems !**



# Disease Progression

Long-term nasal congestion, purulent discharge, marked loss of smell, dull facial pressure and night-time cough. The sinus lining can undergo permanent changes, including thickening, polyps and impaired mucus clearance.

## *Chronic Sinusitis*



Severe headache or facial pain, yellow-green purulent discharge, nasal congestion, reduced sense of smell, fever. The sinus openings become blocked by swollen mucosa, which traps secretions and creates a breeding ground for bacteria.

## *Acute Sinusitis*

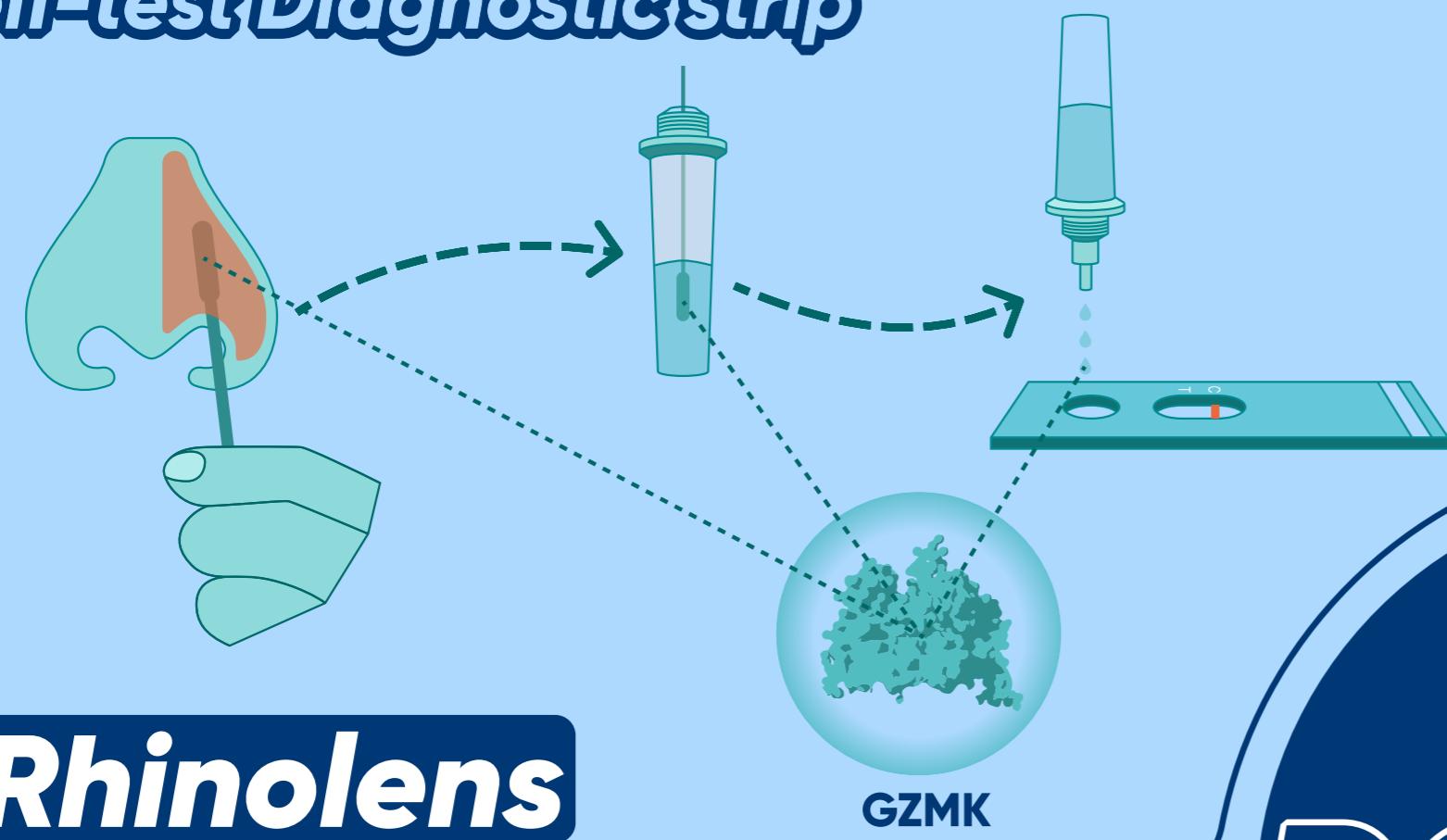
## *Severe Complications*

Although rare, severe complications of sinusitis can occur. Chronic inflammation can spread to adjacent vital structures, leading to serious conditions including blindness, osteomyelitis, and even coma.

# Our Project

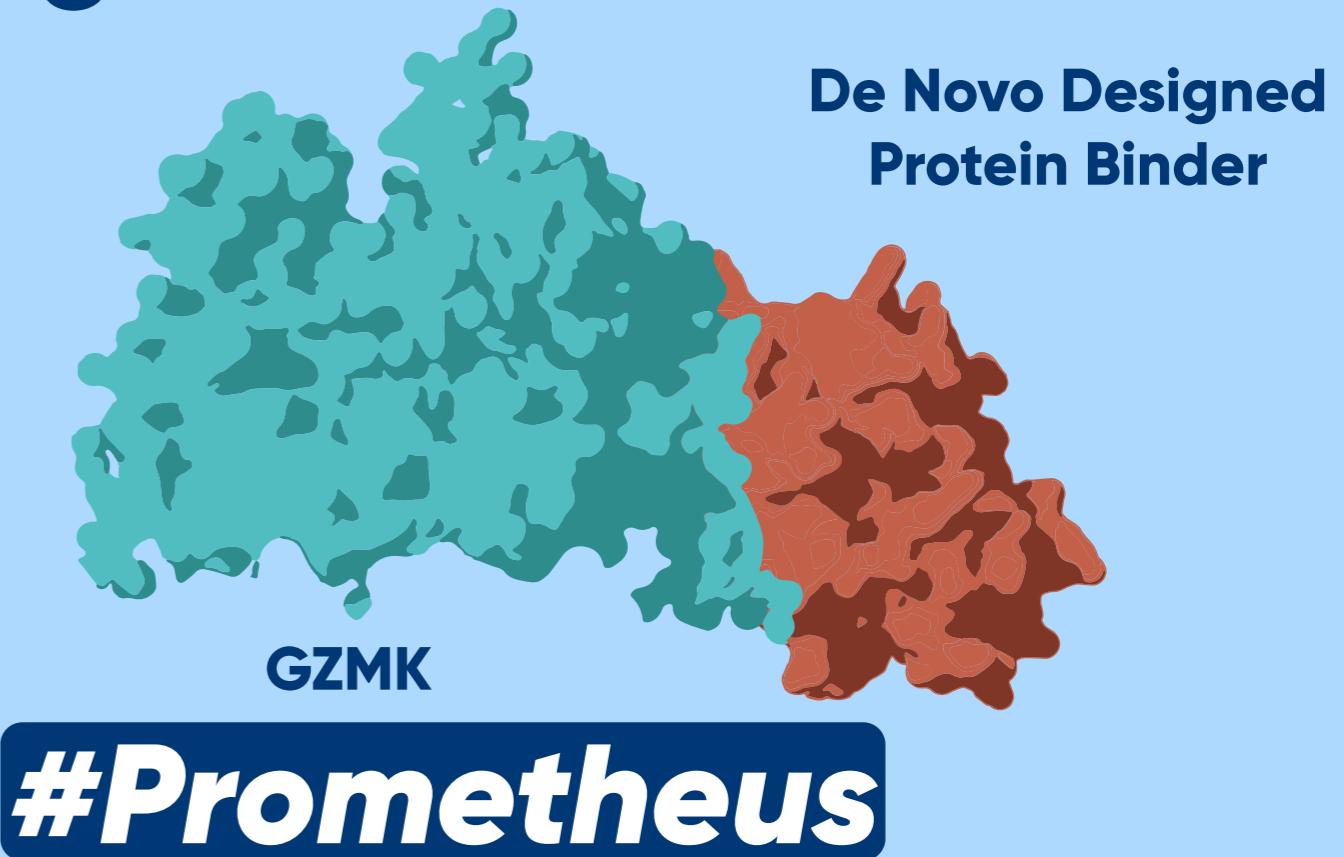
Recent research has revealed that specific immune cells secrete a protein called Granzyme K (GZMK). This protein worsens inflammation, driving the progression from acute to chronic sinusitis and potentially leading to the formation of nasal polyps. Based on the GZMK protein, our team has developed a novel diagnostic and therapeutic approach for rhinosinusitis.

## Self-test Diagnostic strip



#Rhinolens

## Protein Design Tool Kit

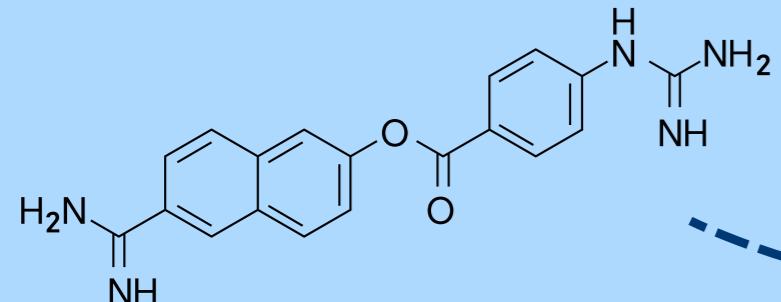


De Novo Designed Protein Binder

GZMK

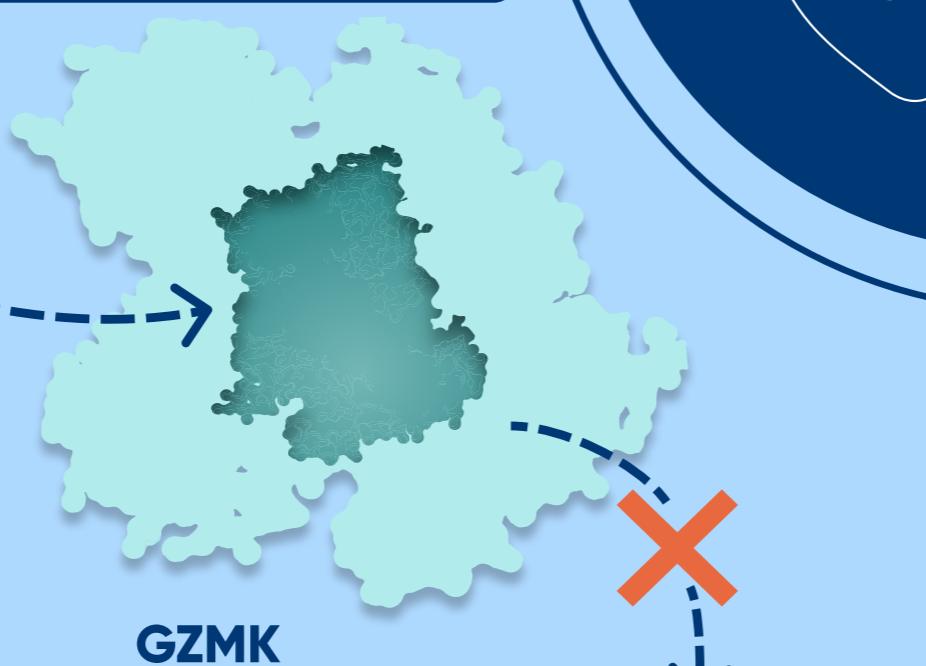
#Prometheus

## #Rhinofree



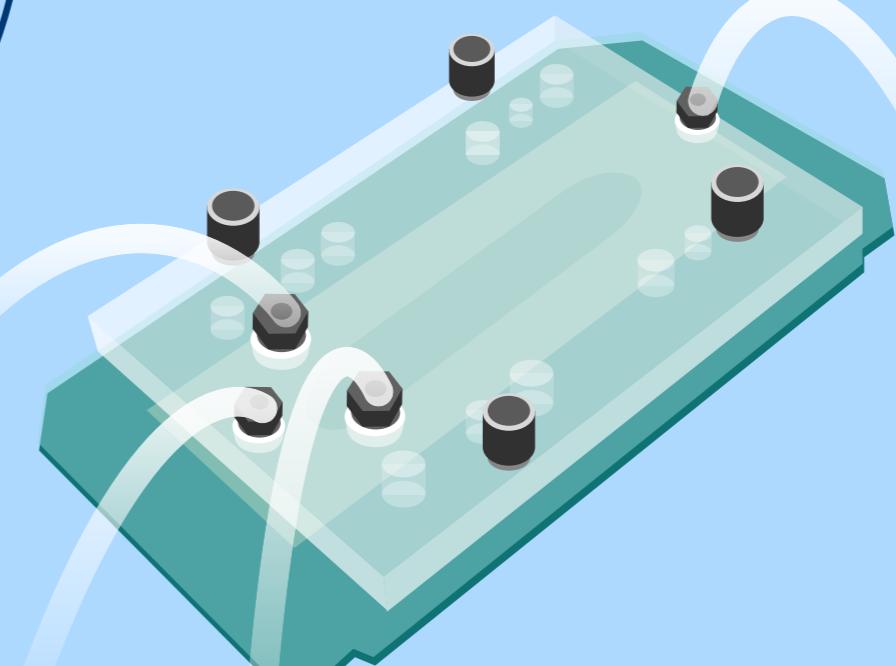
Small Molecular Inhibitor

Candidate drug



GZMK Activity

## #Nexus

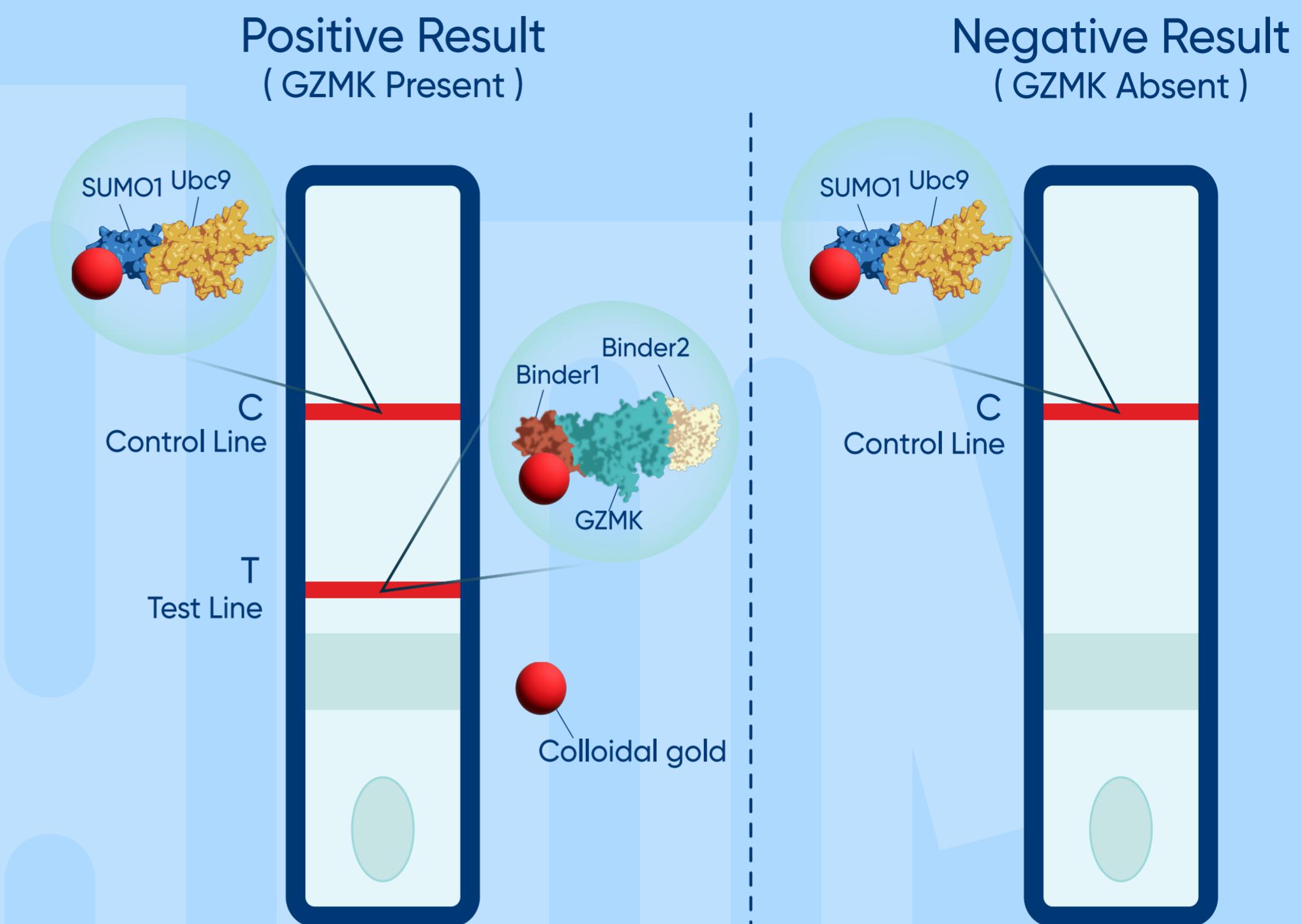


High-throughput Screening Platform



# Early Diagnosis

To enable early diagnosis and disease monitoring of rhinosinusitis, we set out to develop a rapid and reliable detection tool for GZMK. Leveraging the principles of lateral flow immunochromatography, we engineered a colloidal gold test strip named Rhinolens for swift, on-site detection of GZMK. The key innovation lies in replacing traditional antibodies with a computationally designed protein binder that recognizes GZMK with high specificity and affinity.



# Precision Treatment

We target GZMK and obtain small-molecule inhibitors of GZMK through virtual and physical screening, developing them as novel therapeutics for rhinosinusitis to advance precision medicine in this field.

