

## *The Impact of Cigarette Smoke and Heated Tobacco Product Generated Aerosol on Corneal Epithelium*

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Università  
di Catania

Biochemistry and Molecular Biology

## **Comparative Evaluation of Cigarette Smoke and a Heated Tobacco Product on Corneal Oxidative Stress in an Air/Liquid Interface Model**

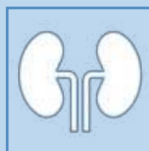
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# OBJECTIVES



To compare the effects of HTPs and traditional combustible cigarettes on reducing tissue damage, both in *ex vivo* and *in vitro* models of corneal epithelium;



To evaluate the potential oxidative stress and pro-inflammatory effects of the IQOS and 1R6F exposure on corneal epithelium as *ex vivo* model;



To assess the potential oxidative stress and pro-inflammatory effects of IQOS and 1R6F exposure on SIRC cells as *in vitro* model;



# MATERIALS AND METHODS



## *Ex-vivo* model

Corneal epithelium

Histopathological analysis

qPCR

Analysis of Tryptic

Digests by LC-MS

Smoke/Vapor exposure

Extracellular ROS evaluation

Proteomic Analysis

## *In vitro* model

Cell culture and air-liquid

interface (ALI) exposure method

Intracellular ROS assessment

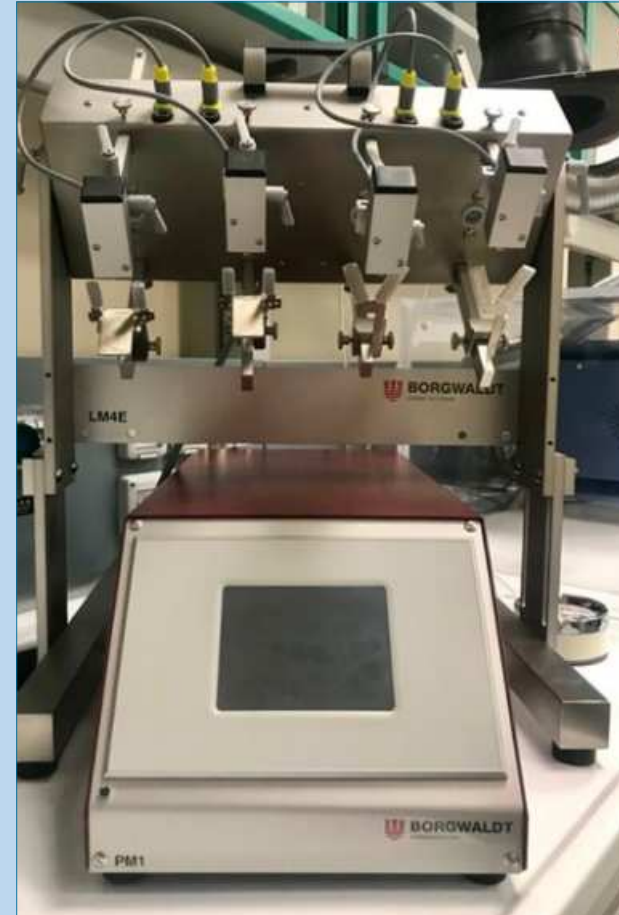
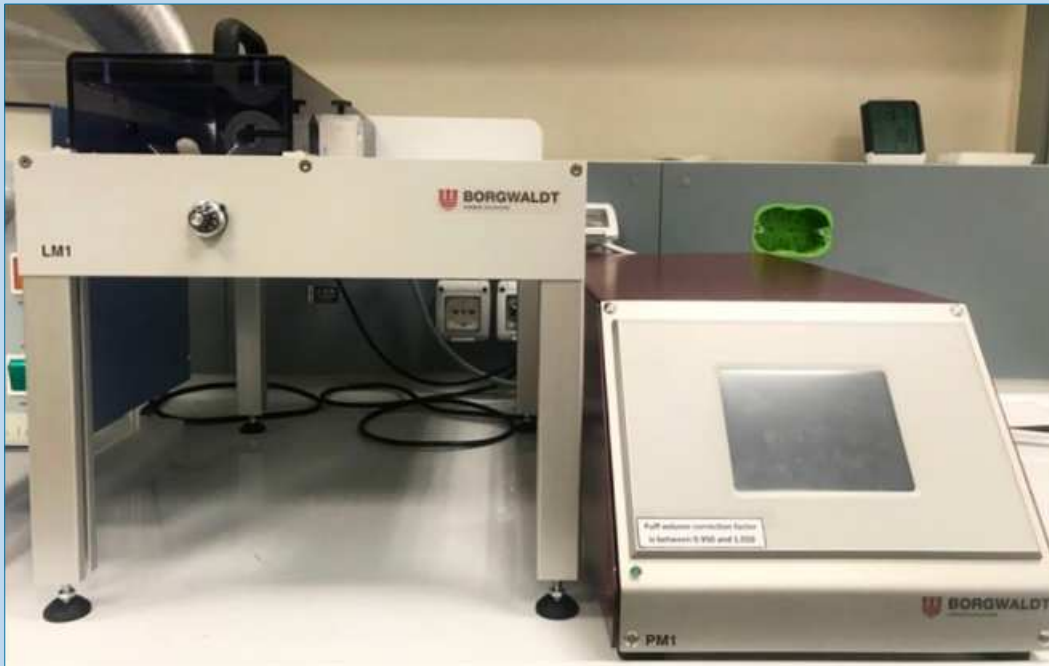
Scratch assay

GSH assay

# MATERIALS AND METHODS



## SMOKE/VAPOUR EXPOSURE



# MATERIALS AND METHODS



## SMOKE/VAPOUR EXPOSURE

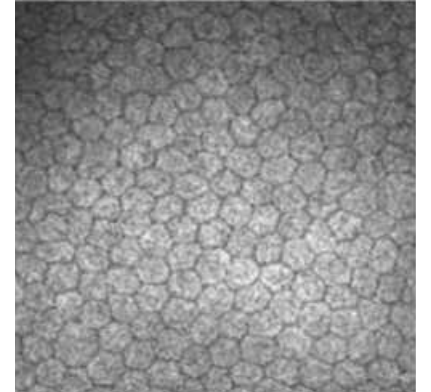




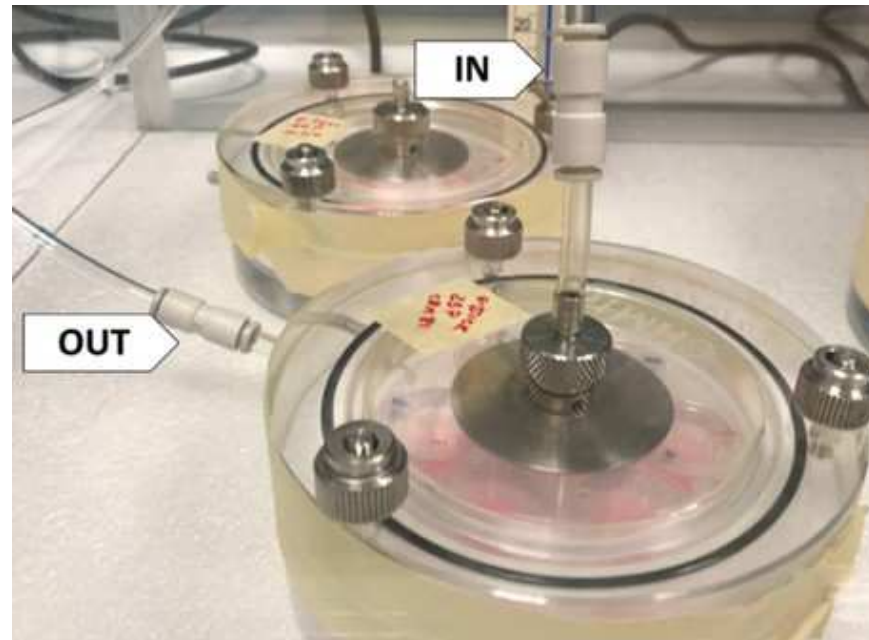
# MATERIALS AND METHODS



STATENS SERUMINSTITUT RABBIT CORNEA (SIRC) CELL CULTURE

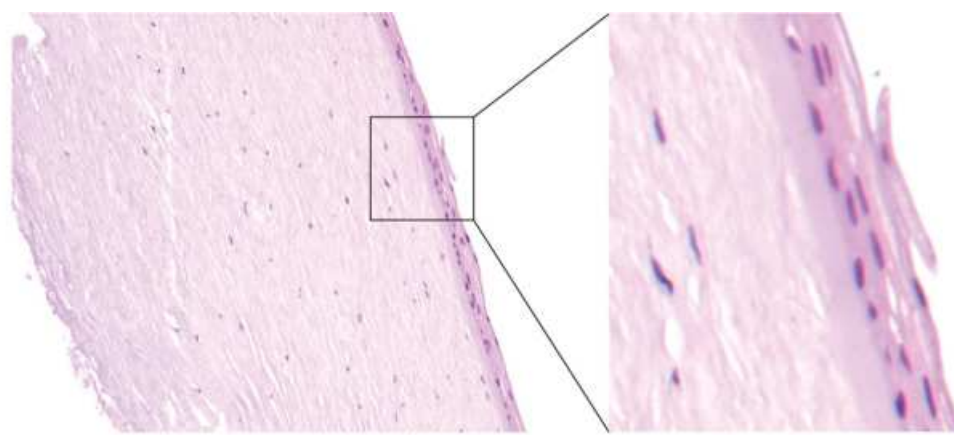


AIR-LIQUID INTERFACE (ALI) EXPOSURE METHOD

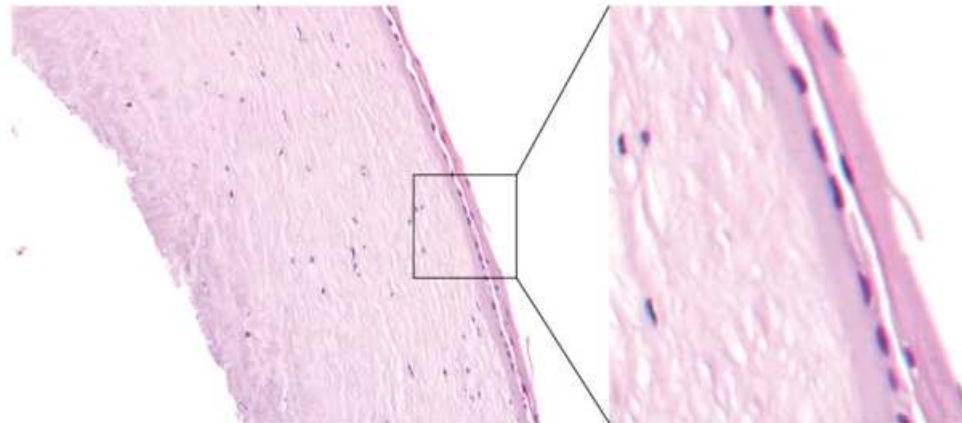


# RESULTS

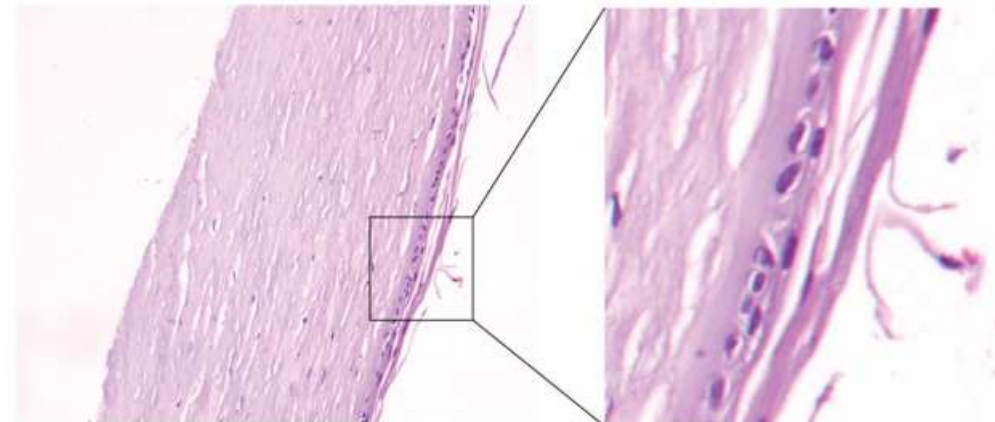
AIR



IQOS



1R6F



## Ex-vivo model

Corneal epithelium  
 exposed to:  
 1. Ambient air (CTRL AIR);  
 2. IQOS;  
 3. 1R6F, stained with  
 hematoxylin and eosin.



Corneal epithelium  
 exposed to 1R6F  
 exhibits significant  
 structural disruptions  
 and signs of oxidative  
 stress and inflammation  
 compared to the CTRL  
 AIR and IQOS exposures.



# RESULTS

Extracellular ROS evaluation  
in corneal epithelium

Expression levels of oxidative stress  
and pro-inflammatory genes

*Ex-vivo* model



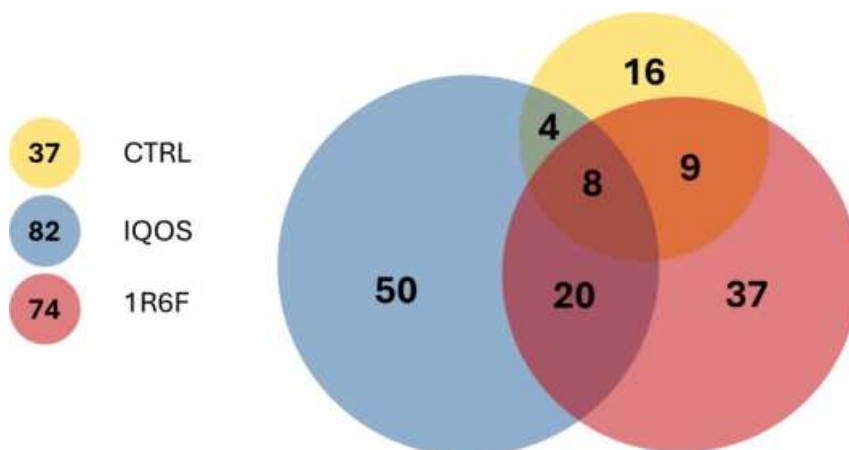
ROS levels were significantly higher in 1R6F compared with AIR and IQOS exposures.



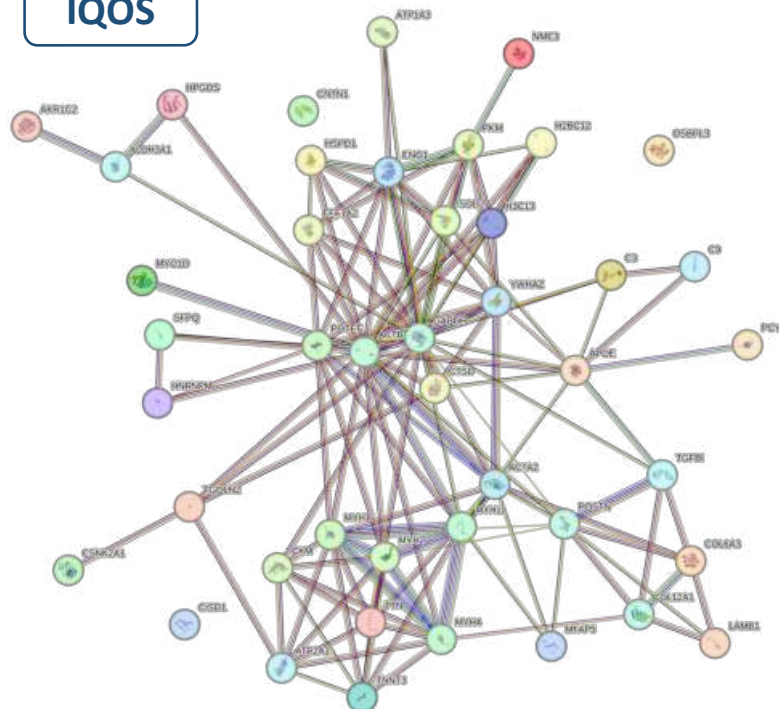
1R6F exhibited a significant increase in the expression of including IL-6, IL-1 $\beta$ , TGF- $\beta$ , HMOX-1, and PTGS-2 compared to AIR and IQOS counterparts

# RESULTS

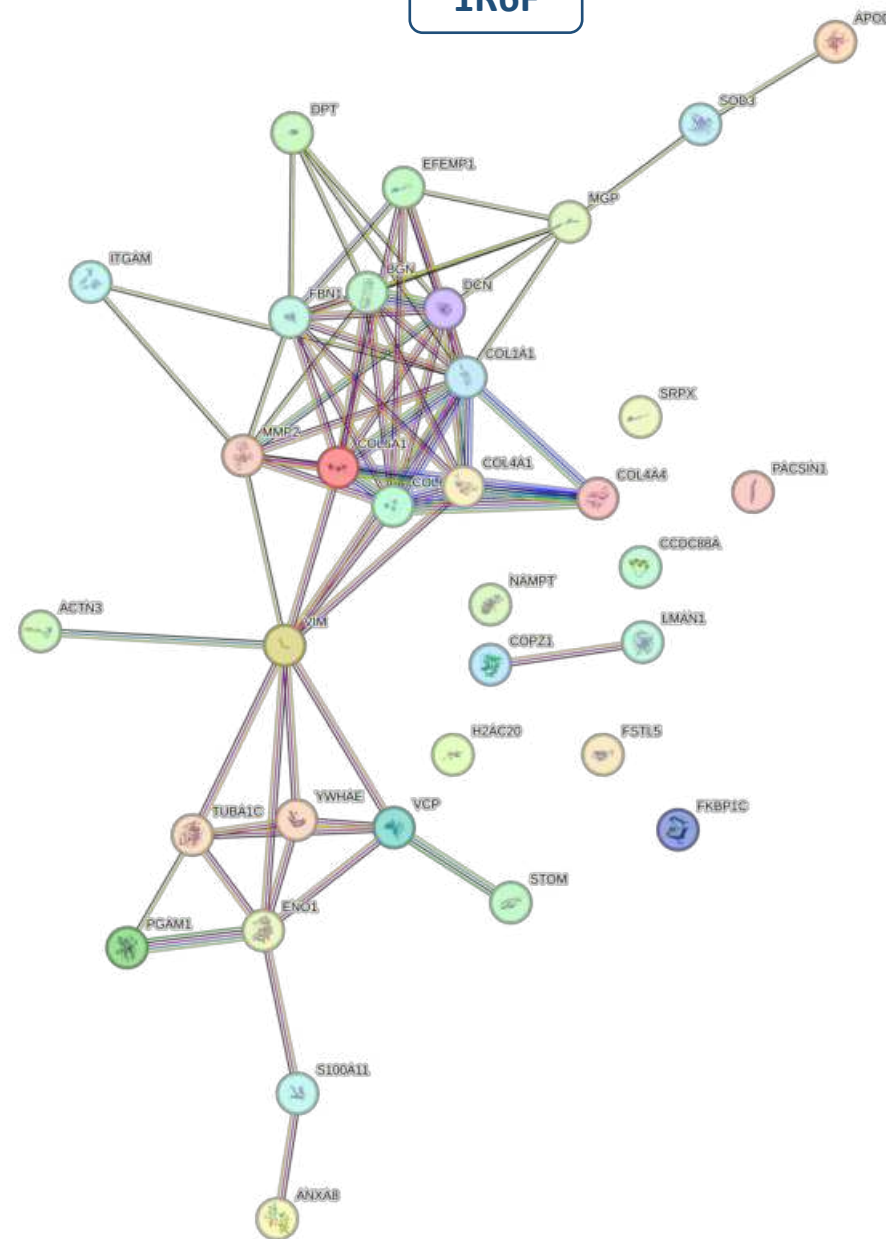
## Ex-vivo model



## IQOS

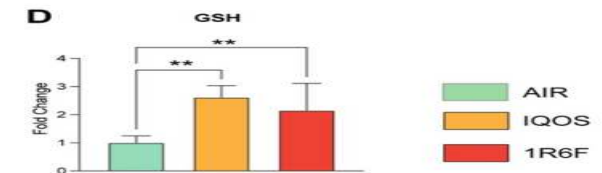
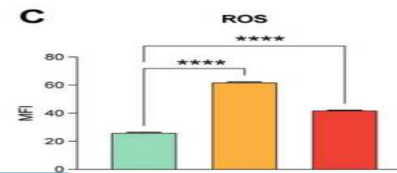
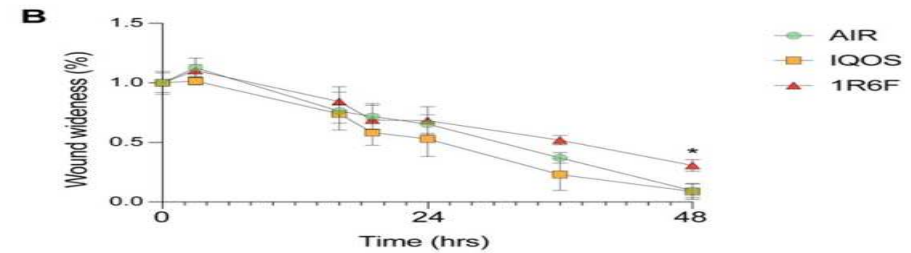
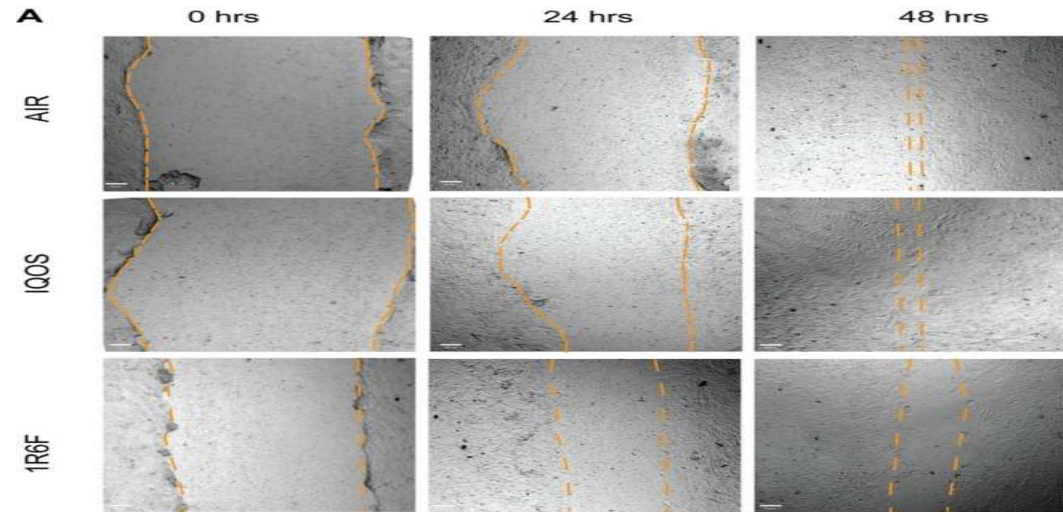


## 1R6F



# RESULTS

## *In vitro* model

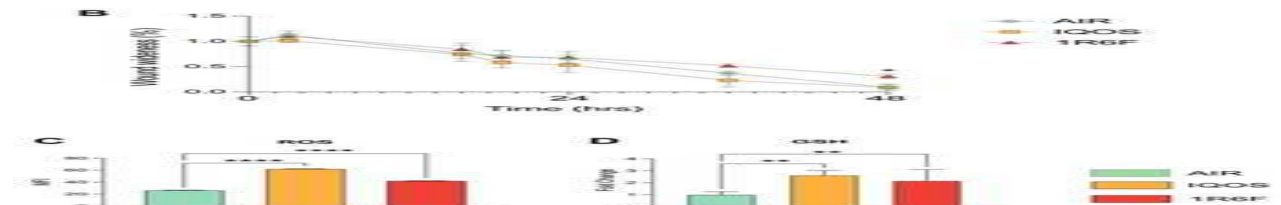
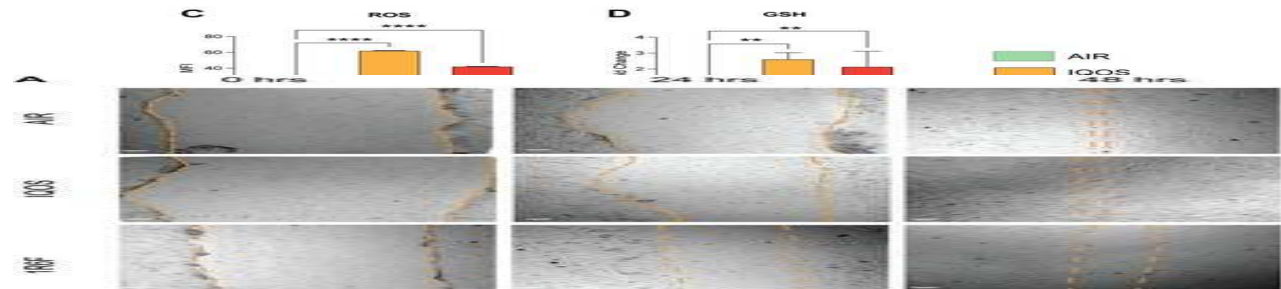
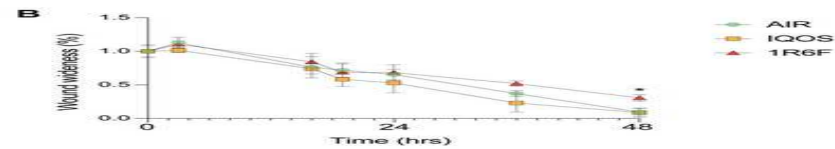
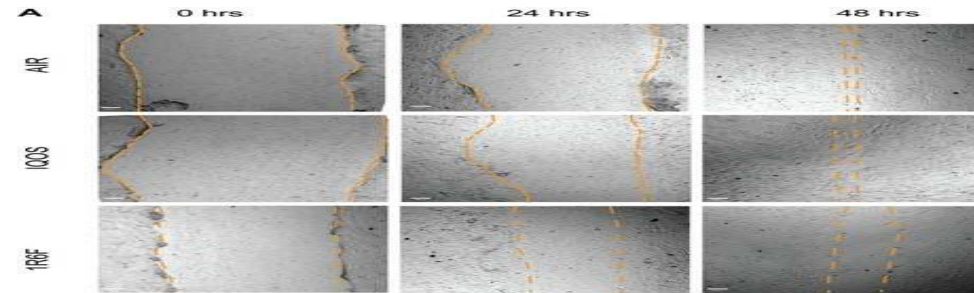


**1R6F group resulted in a significant decrease of proliferation compared with AIR and IQOS groups.**



*In vitro* model

RESULTS



**SIRC cells exposed to air exhibit significantly lower ROS levels** compared to those exposed to IQOS and 1R6F. Moreover, IQOS leads to a higher cellular GSH level after 24 hours compared to cells exposed to AIR and 1R6F.

# DISCUSSION AND CONCLUSION

- Exposure to IQOS shows reduced cellular damage and inflammation in the corneal epithelium, therefore being comparable to cigarette smoke exposure;
- Exposure to traditional combustive cigarettes induces higher levels of oxidative stress and inflammation in the corneal epithelium and impairs wound healing in corneal epithelial cells, than ambient AIR and IQOS exposures;
- Proteomic analysis unveiled different oxidated proteins following IQOS and 1R6F exposure. Interestingly, this outcome might be related to an impairment of protein biological function, therefore affecting several pathways downstream;
- Our results offer valuable insights into the impact of tobacco smoke and HTPs on the corneal epithelium, suggesting the need for ongoing research and public health initiatives to enhance ocular health outcomes and reduce the prevalence of smoking-related ocular disorders.

