



UNIVERSITÀ DEL PIEMONTE ORIENTALE

seminario

**LA FILIERA APISTICA:  
DALLA VALORIZZAZIONE DELLE  
PRODUZIONI ALLA INNOVAZIONE  
QUALE PERCORSO CHIAVE PER LO  
SVILUPPO COMPETITIVO DEL SETTORE**

21 GENNAIO 2022, ore 17.00

# **Miele e rigenerazione tissutale: una insolita questione di "calcio"**

**Elia Ranzato**

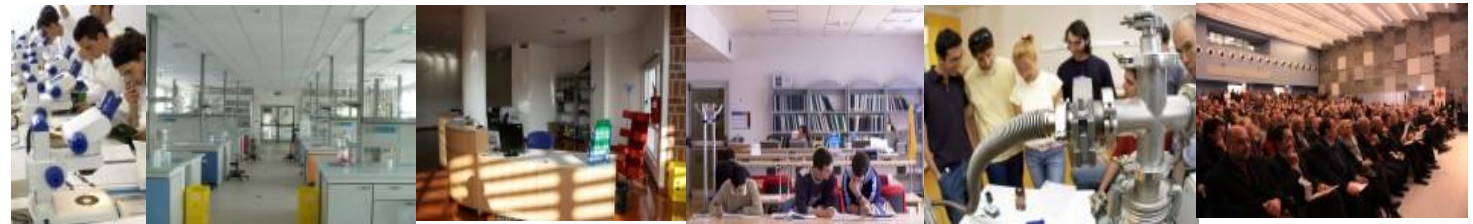
Dipartimento di Scienze e Innovazione Tecnologica

Università del Piemonte Orientale

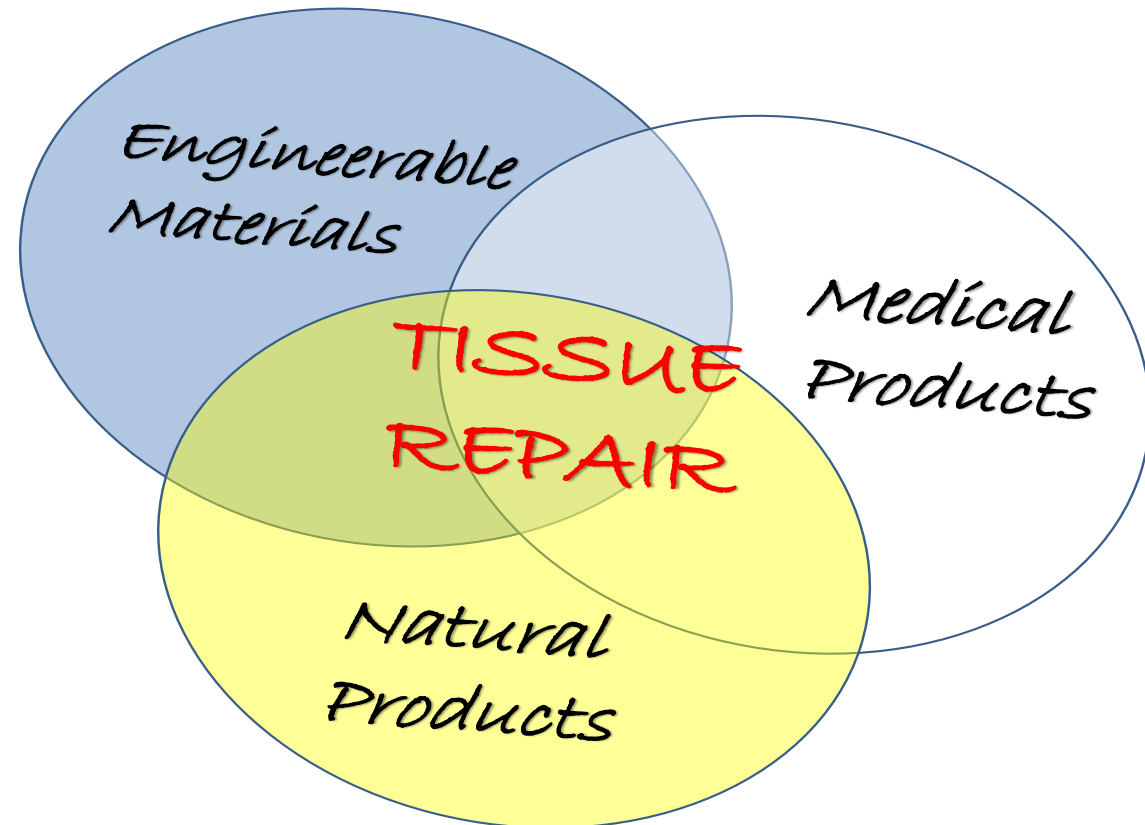
[elia.ranzato@uniupo.it](mailto:elia.ranzato@uniupo.it)



# Alessandria



Medical, natural, and  
bioengineered products  
for tissue repair:  
mechanisms of action







Jojoba oil

Ranzato et al., J Ethnopham 2011

- Ophioglossum vulgatum*
- Clericuzio et al., J Nat Med 2014
  - Clericuzio et al., Planta Medica 2012



Lichens

Bruno et al., Bioinorg Med Chem 2013

Dibenzofuran derivatives with antibacterial and wound-healing activity.

Patent number WO 2013/189950, December 2013.



Honey

- Ranzato et al., WRR 2012
- Ranzato et al., Burns & Trauma 2013

# USING HONEY AS NATURAL REMEDY

In **Islam**, there is an entire Surah in the Qur'an called al-Nahal (the Honey Bee).  
Prophet Muhammad strongly recommended honey for healing purposes

In the Christian **New Testament**, Matthew 3:4, John the Baptist is said to have lived for a long period of time in the wilderness on a diet consistind of locusts and wild honey

In **Hinduism**, honey is one of the five elixirs of immortality.

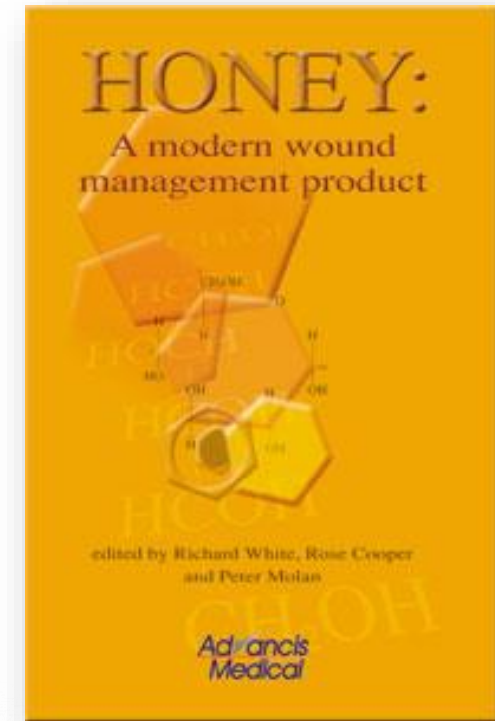


760-656 b.C.

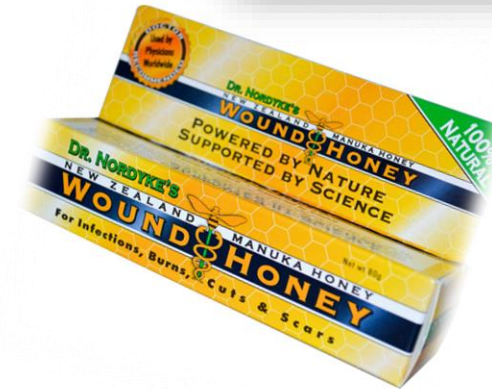


6000 b.C.





Line of dressings containing *Leptospermum* Honey





# Antibacterial activity of honey....



"Honey cleans sores and ulcers of the lips,  
heals carbuncles and running sores."

"Let food be thy medicine and medicine be  
thy food."

~ Hippocrates, father of medicine (431 B.C)





## Properties of Honey

- **Osmotic effect** - high sugar content and low water content leaves very little water molecules available for microorganisms
- **Acidity** – quite acidic with its pH between 3.2 and 4.5 – low enough to inhibit many animal pathogens





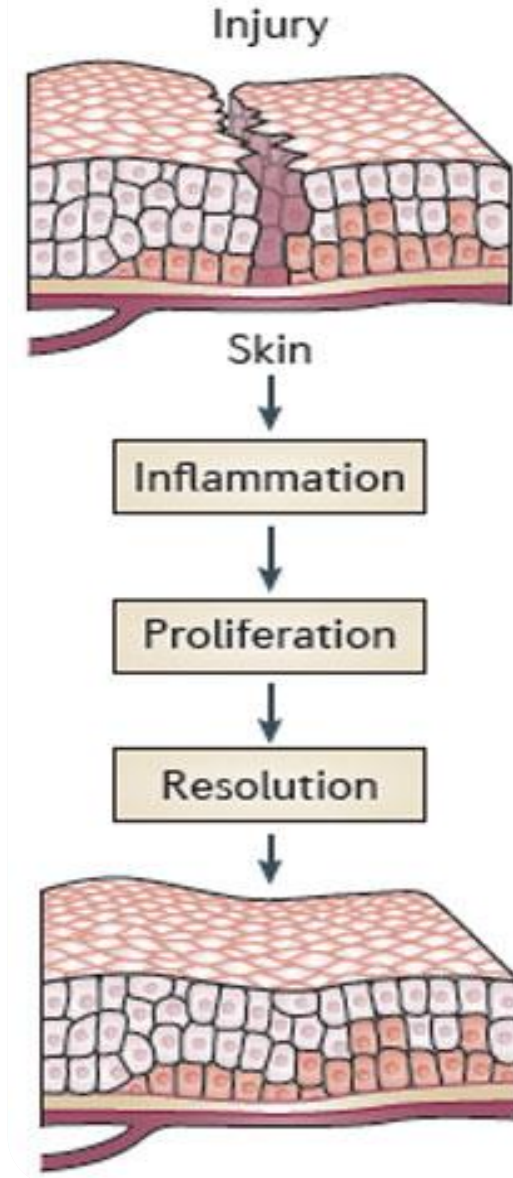


# Other mechanisms???

Wound closure?  
Collagen production?  
Matrix remodelling?



## Normal wound healing





**La ricerca è fatta di quattro cose:  
cervello con cui pensare,  
occhi con cui vedere,  
macchine con cui misurare,  
e....,  
per quarto, denaro**

*(Albert Szent-Gyorgyi)*





# 山田養蜂場 みつばち研究助成基金

Yamada Research Grant



つくばの国産はちみつ  
**山田はちみつ**  
 Yamada Beekeeping Farm



ら、一匹のミツバチが短い生涯をかけた  
 ティースプーン一杯にも満たない  
 花の数は少なくとも15,000個を数え、  
 の結晶がひとさじの蜂蜜になって現れ  
 この貴重な蜂蜜の味を損ねることなく、豊かな栄養価



sweetgourmet.com

る  
 にも達するといひます。  
 、皆様の食卓にお届けしたいと思ひ





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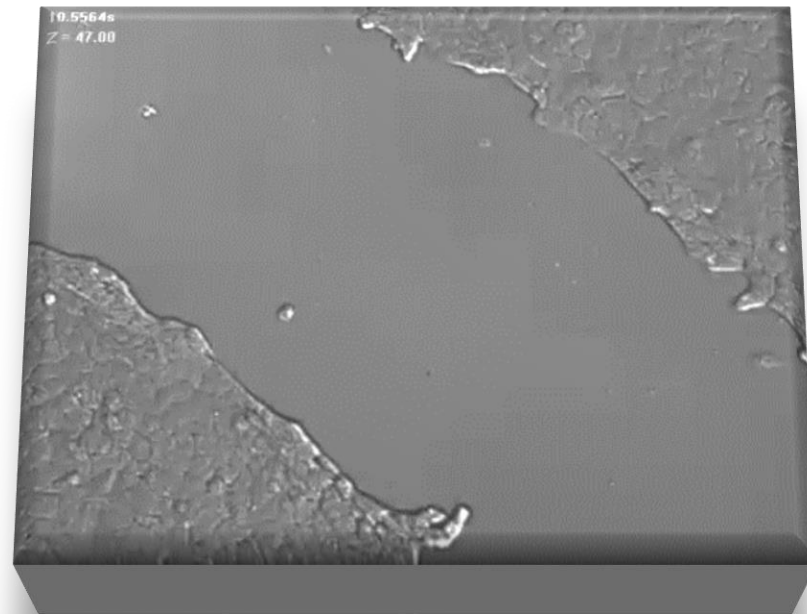
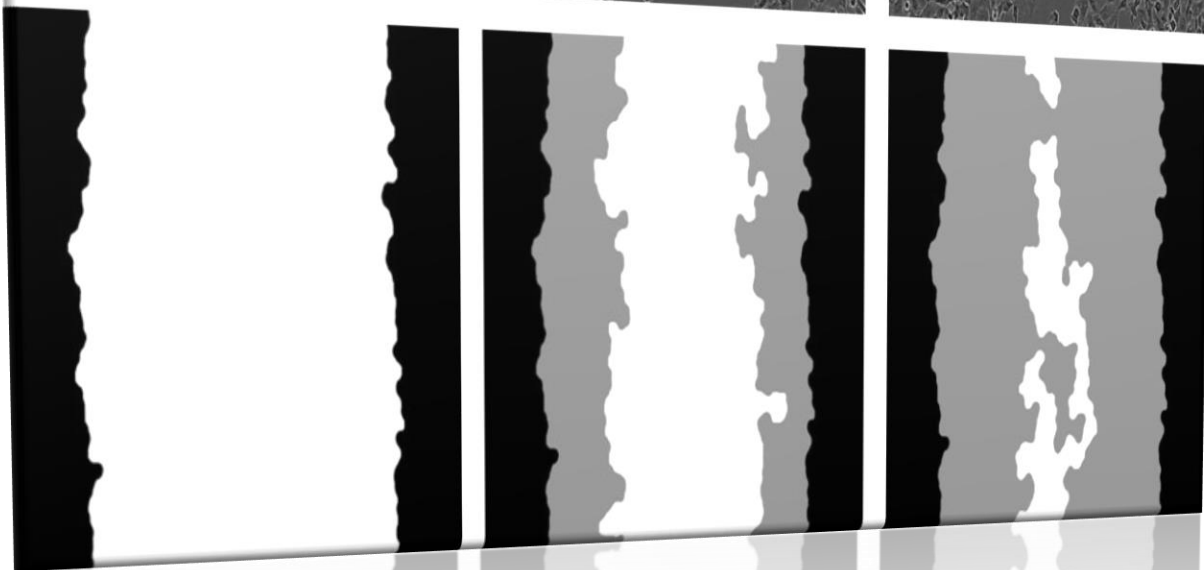
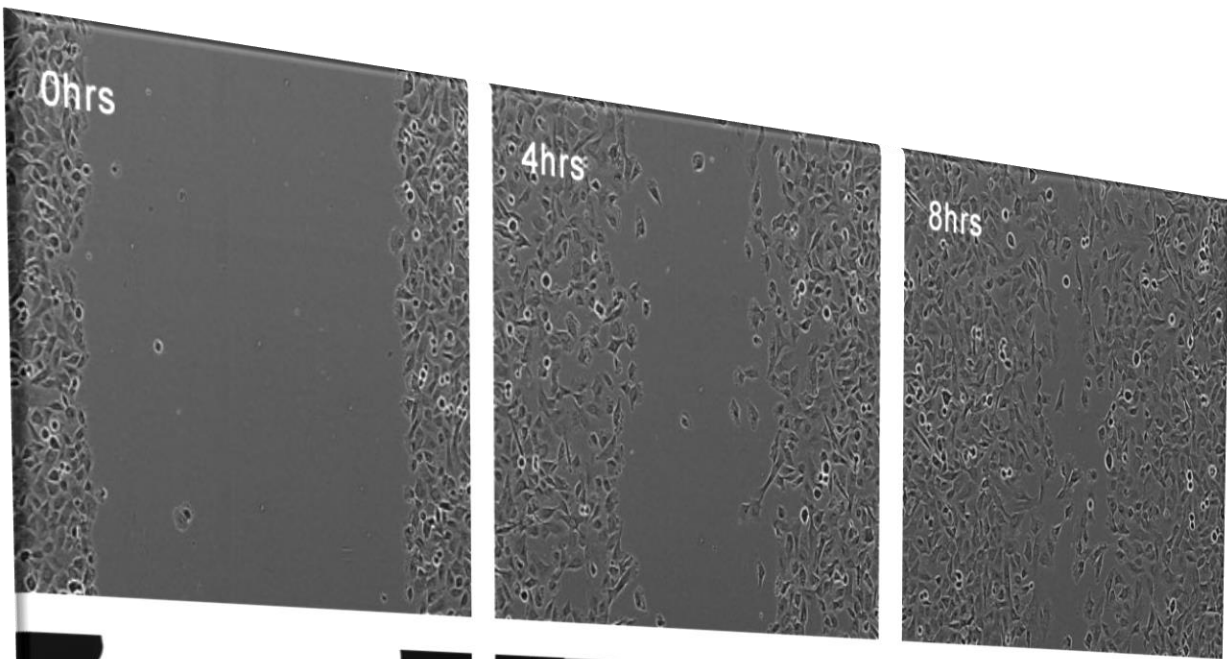
**Simona Martinotti**

Dipartimento di Scienze e Innovazione Tecnologica

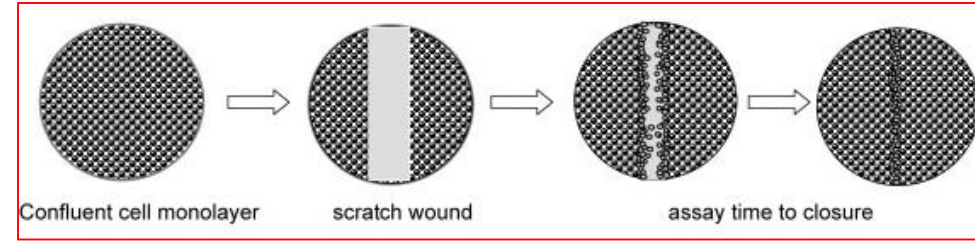
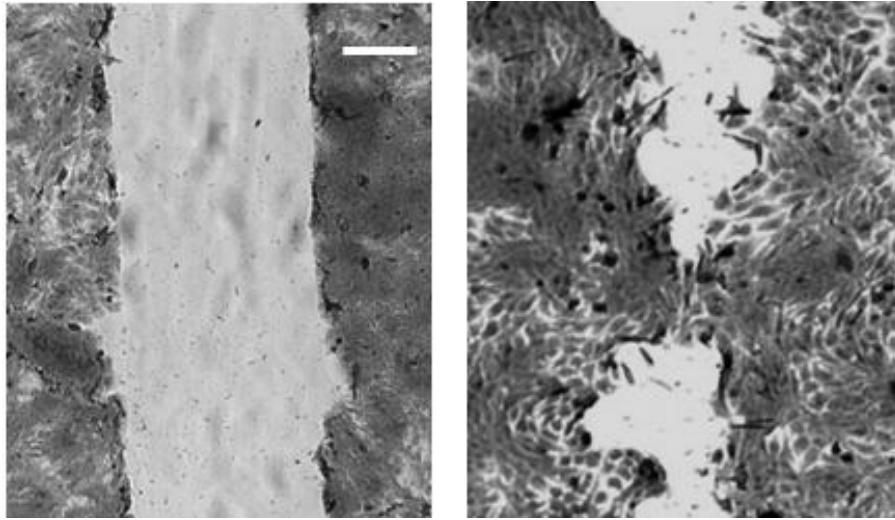
Università del Piemonte Orientale

[simona.martinotti@uniupo.it](mailto:simona.martinotti@uniupo.it)

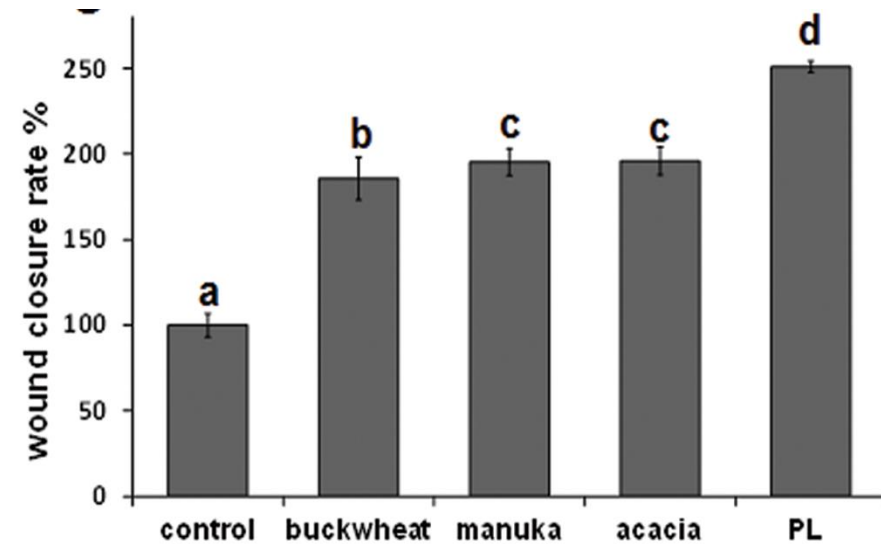
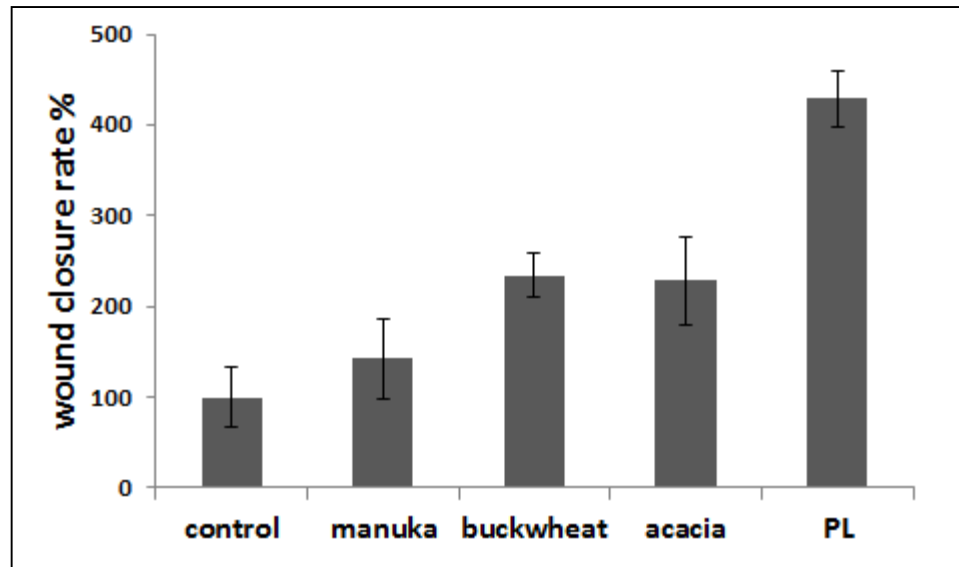




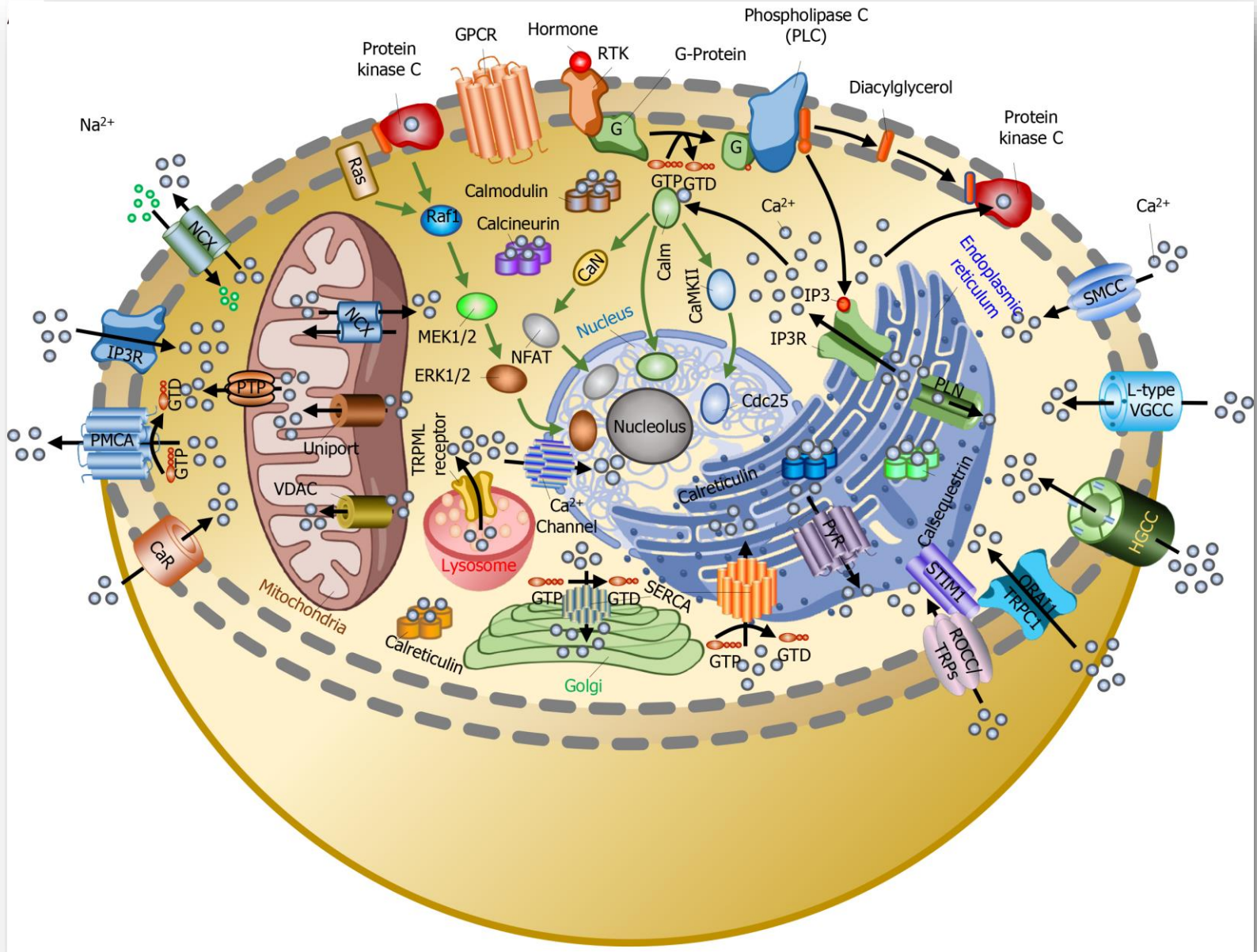


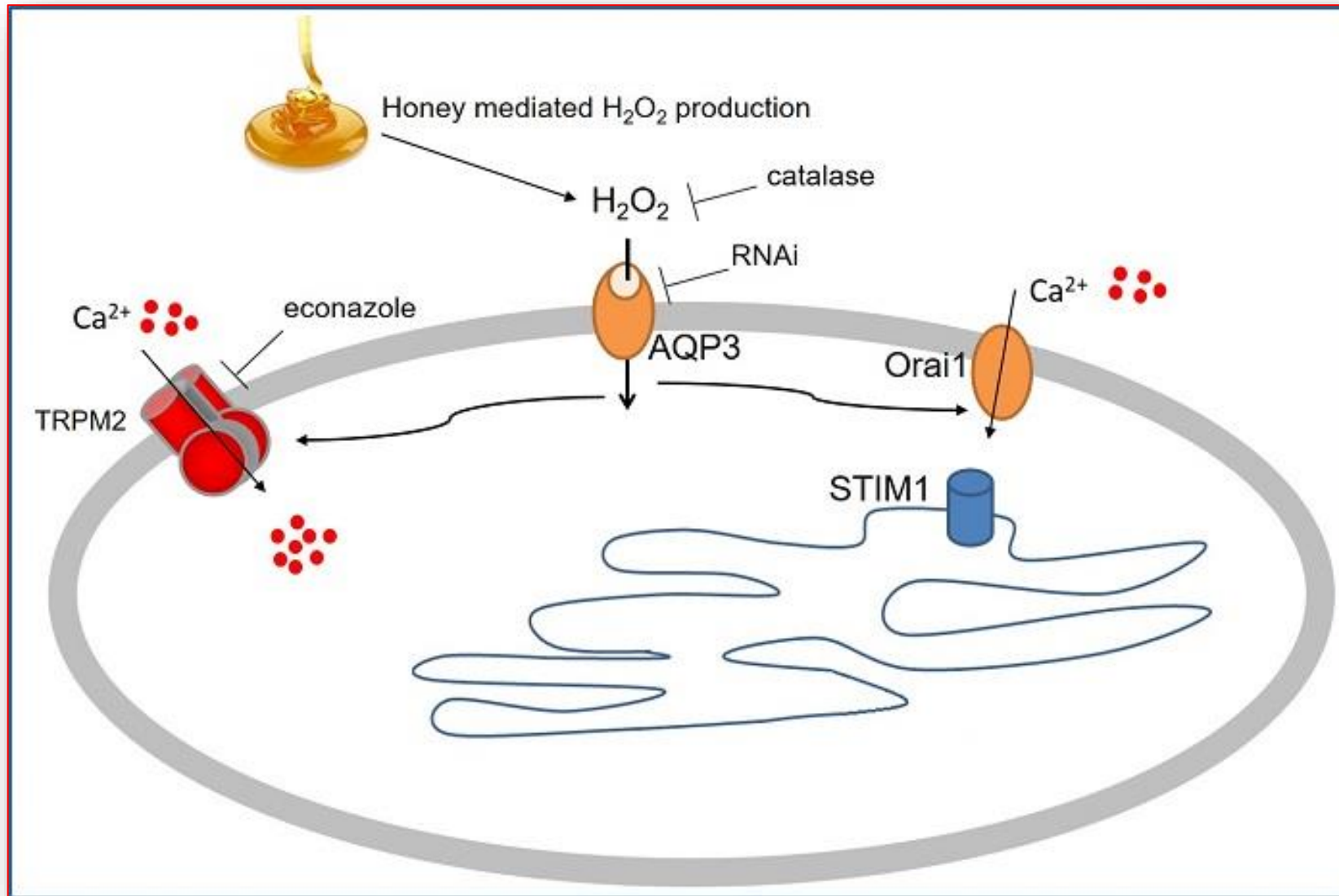


## In vitro scratch wound assay



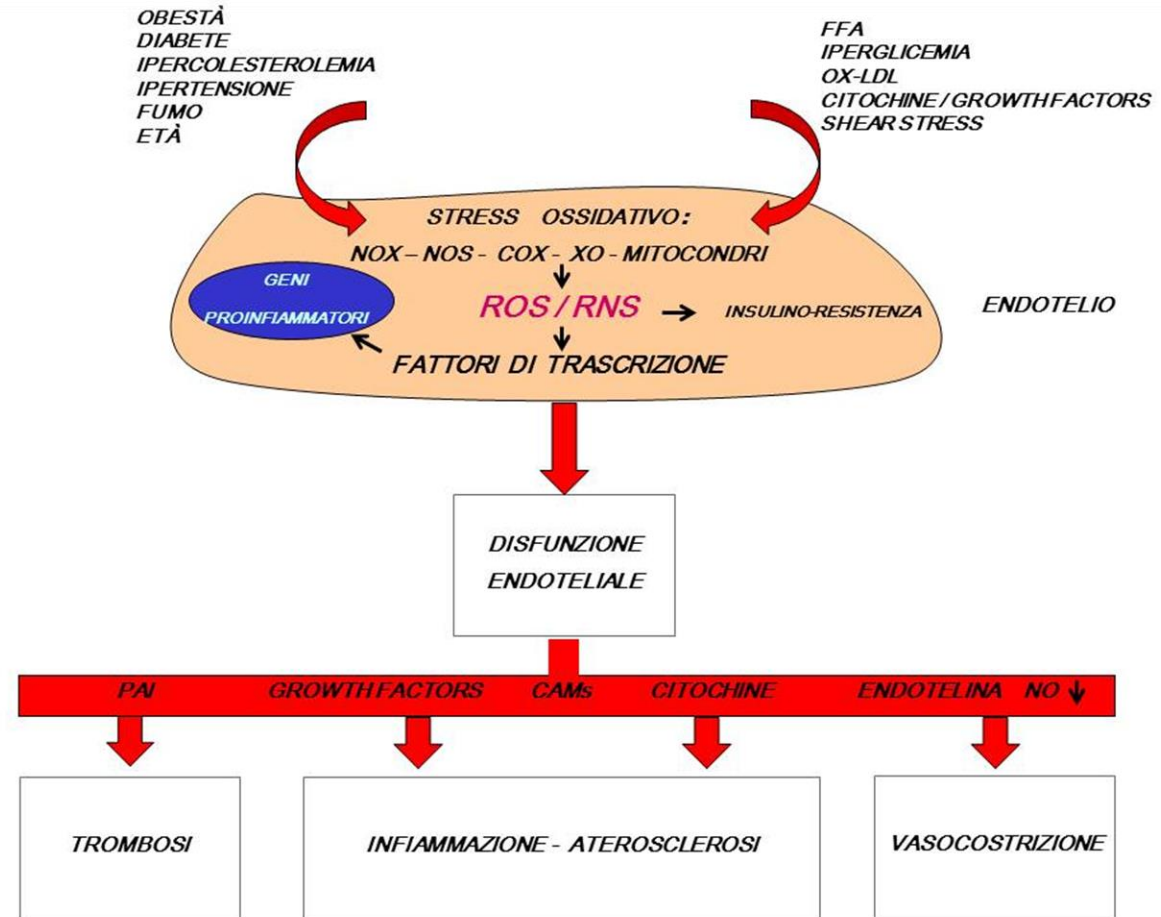
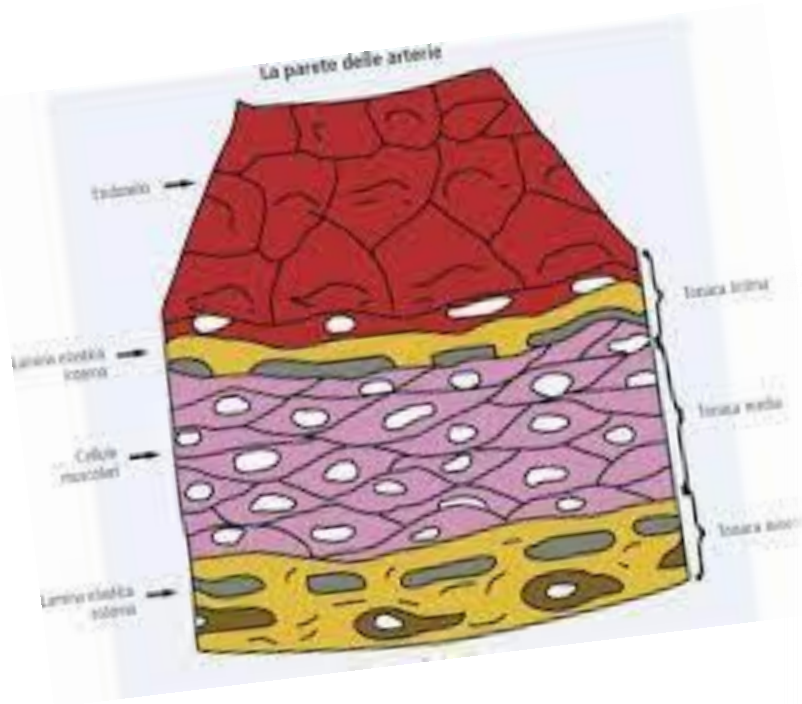
From where  $Ca^{2+}$  can move into the cytosol?

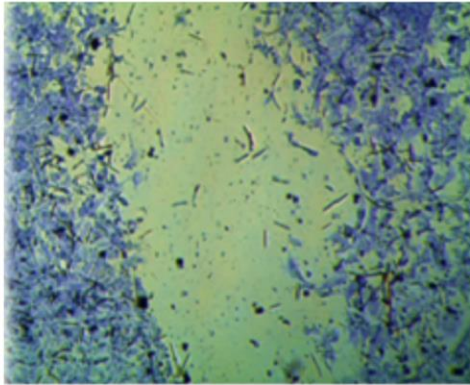




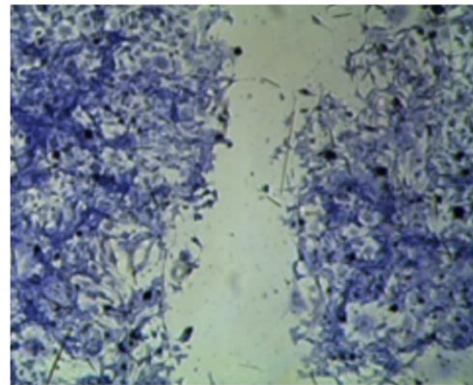


# Endotelio

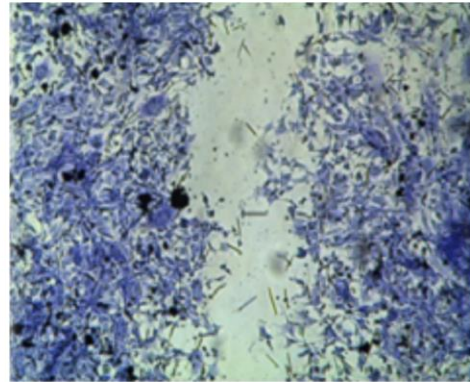




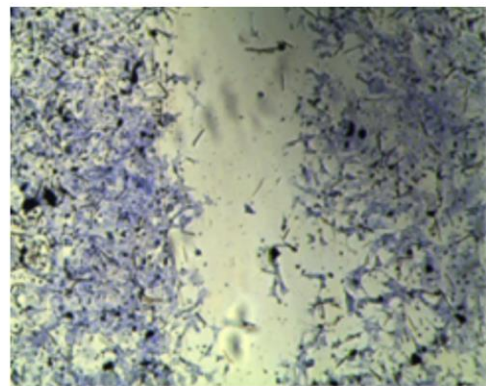
CTRL



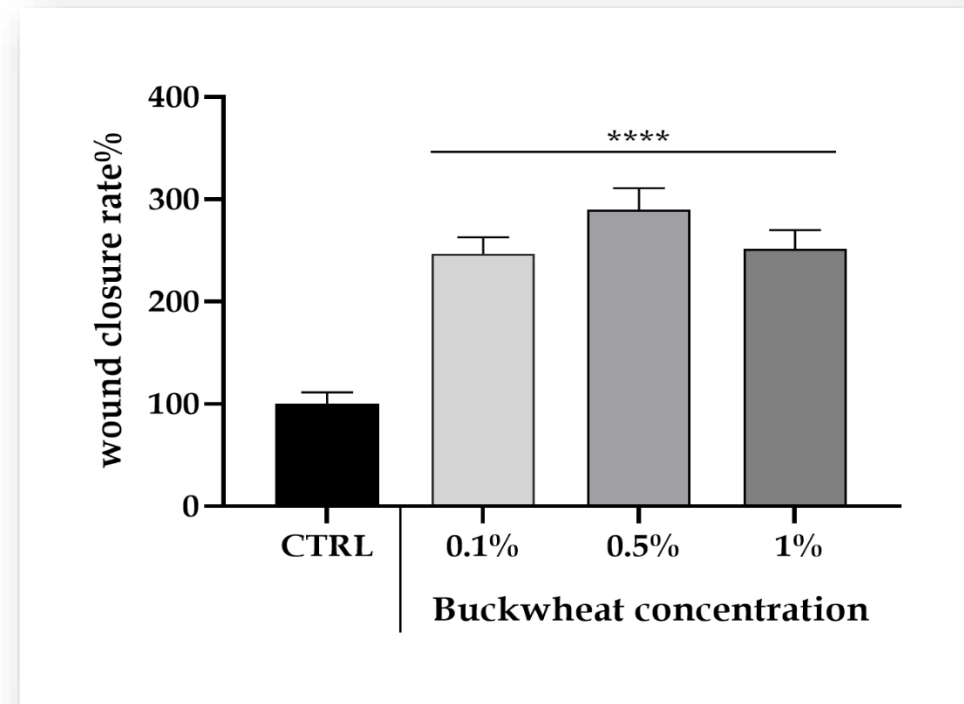
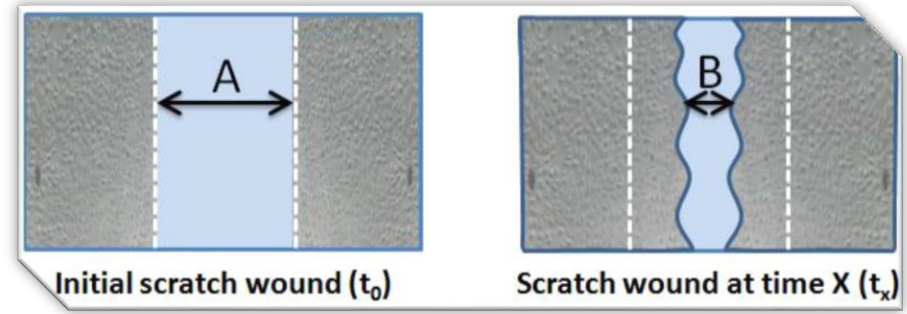
0.1% Buckwheat

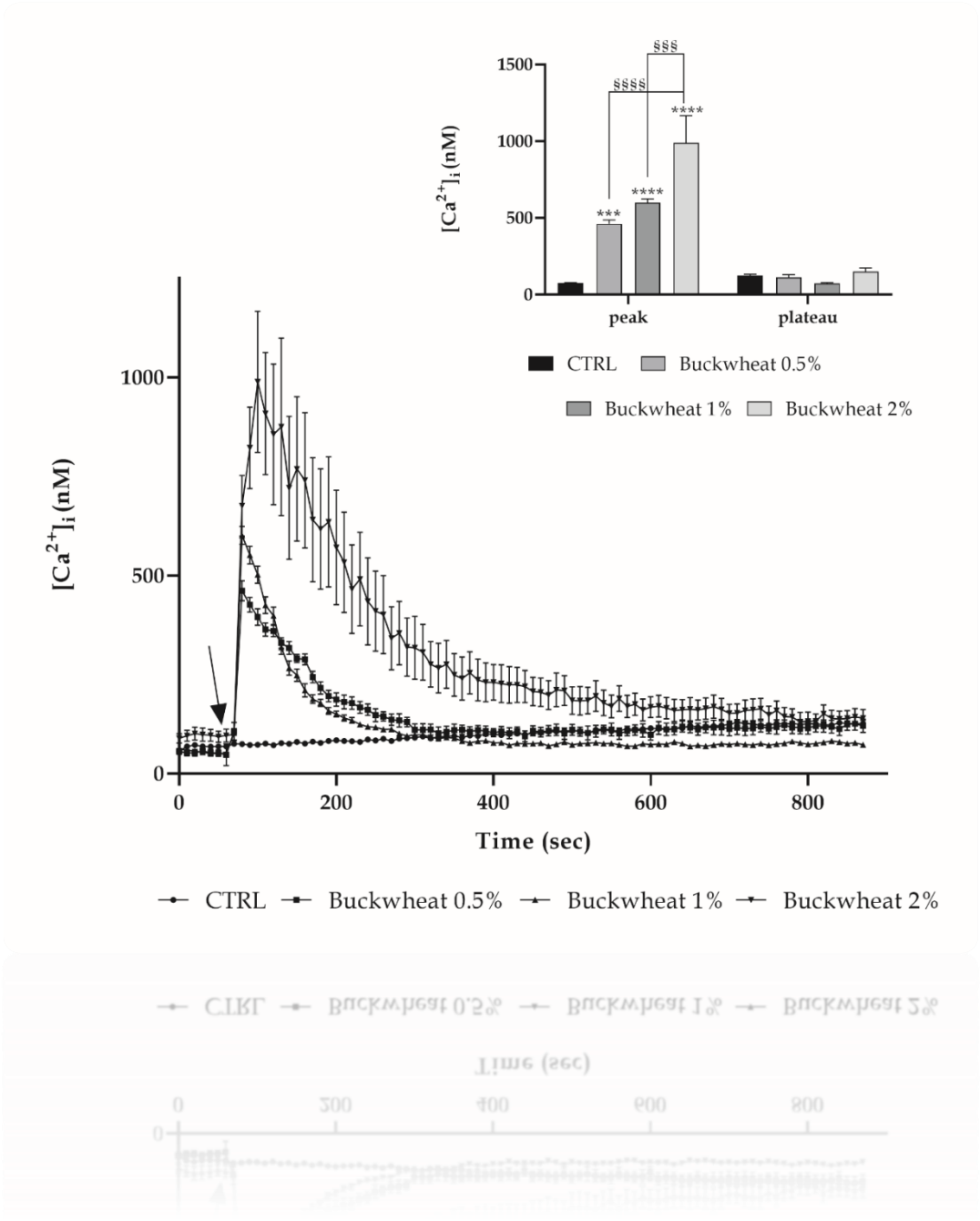
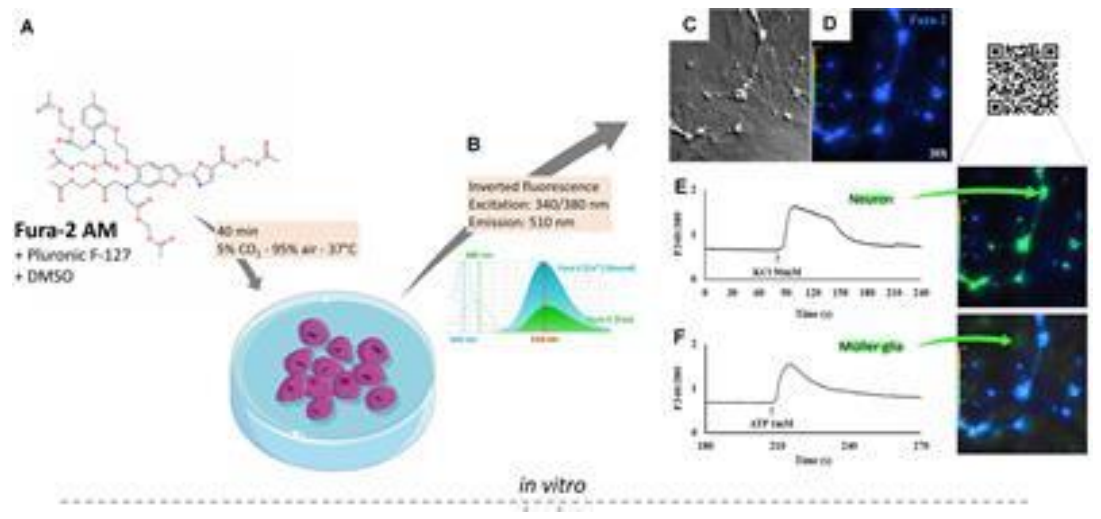
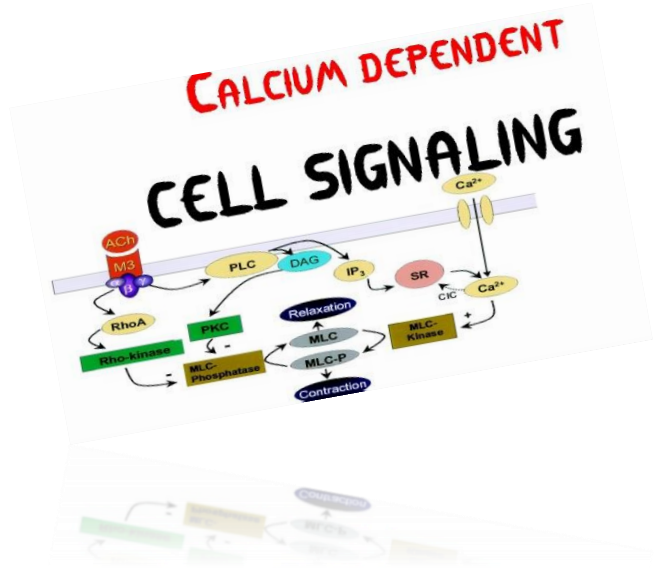


0.5% Buckwheat



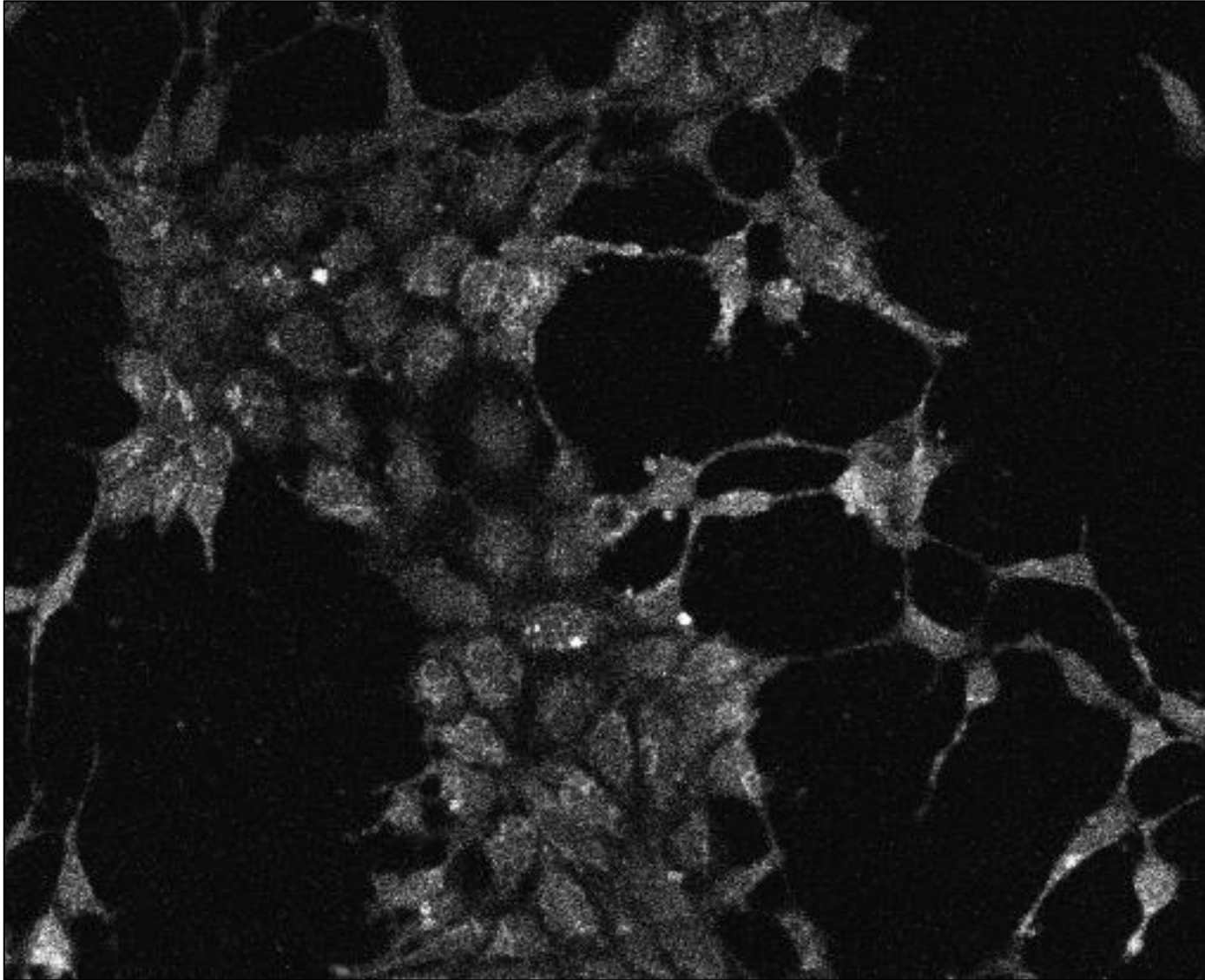
1% Buckwheat



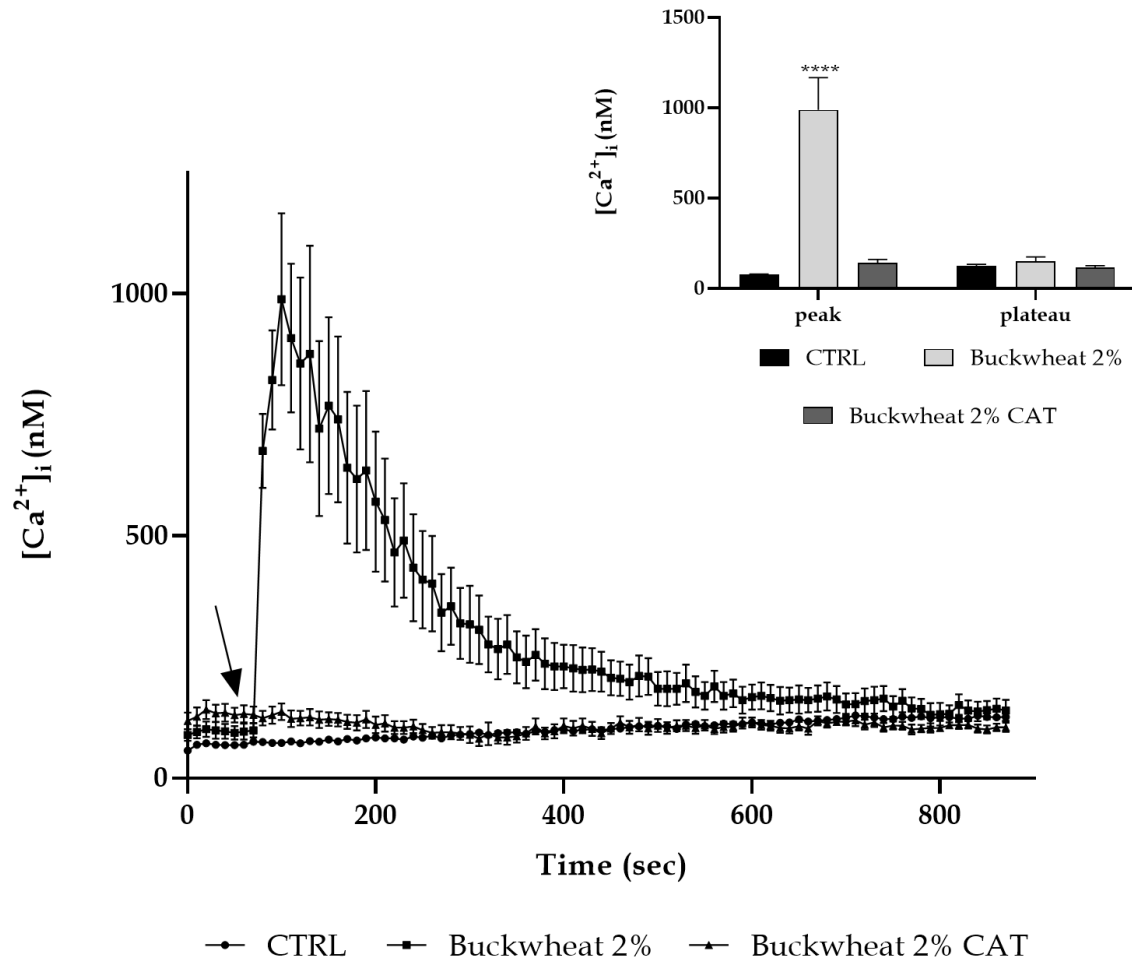




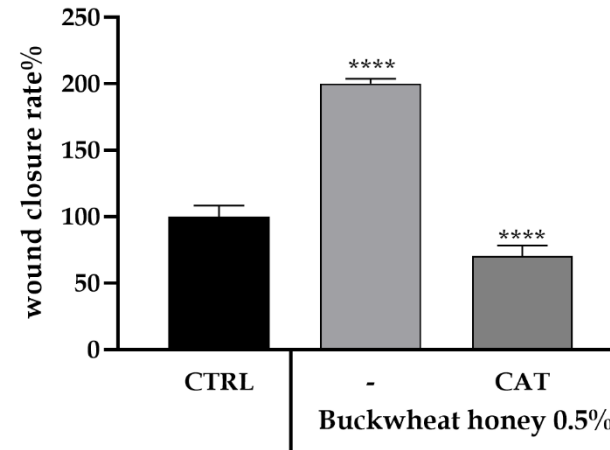
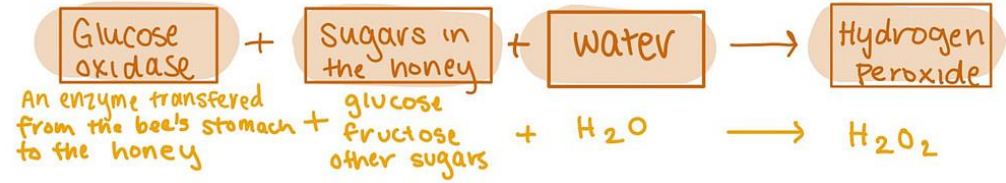
# Confocal imaging of $\text{Ca}^{2+}$ in the honey-induced wound repair



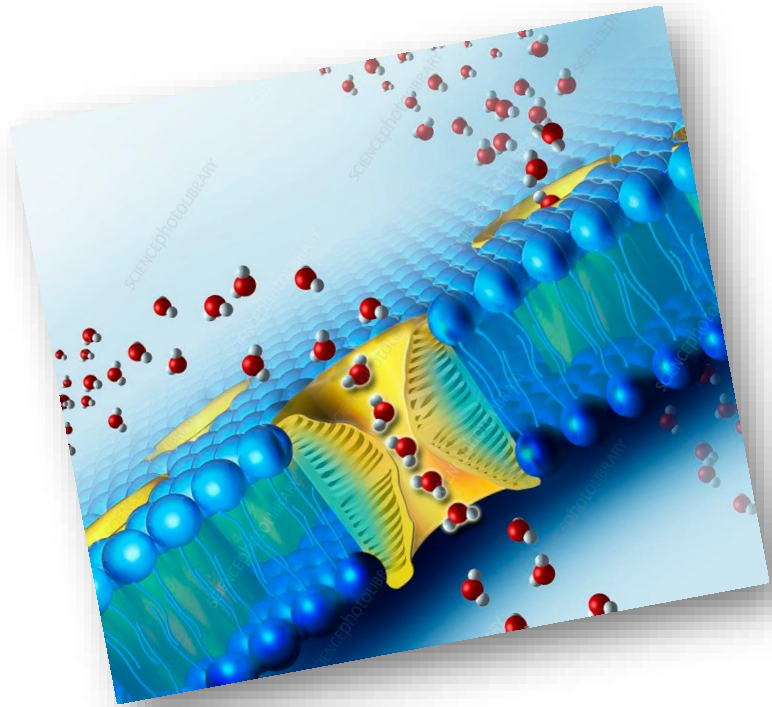
# H<sub>2</sub>O<sub>2</sub> involvement in the Honey boosted Ca<sup>2+</sup> response



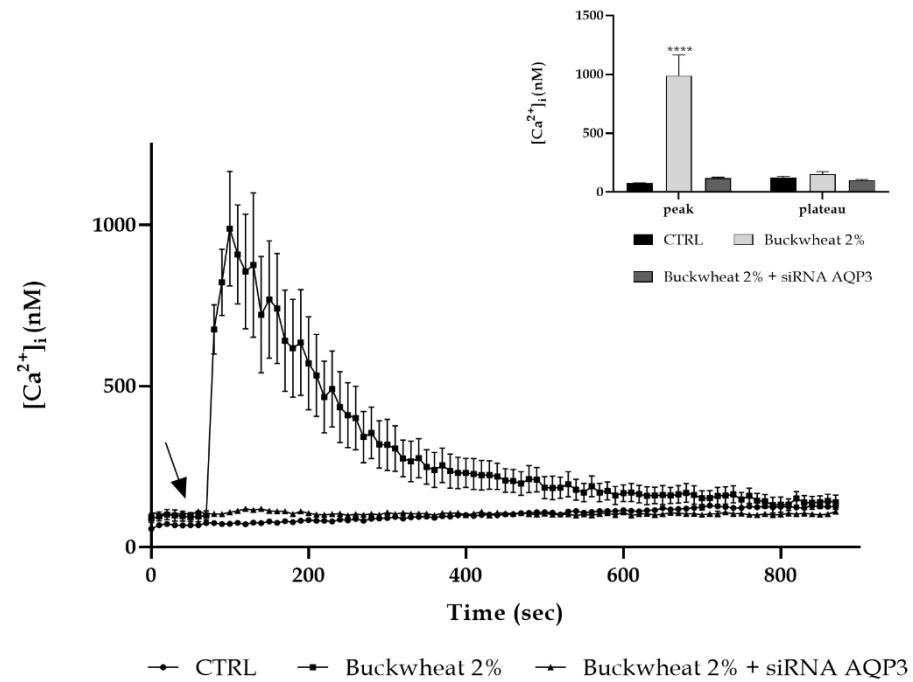
Where does H<sub>2</sub>O<sub>2</sub> in honey come from?  
A chemical reaction:



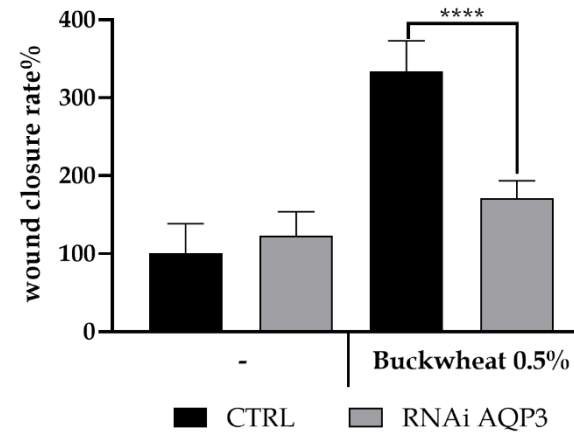
A



# Aquaporina-3

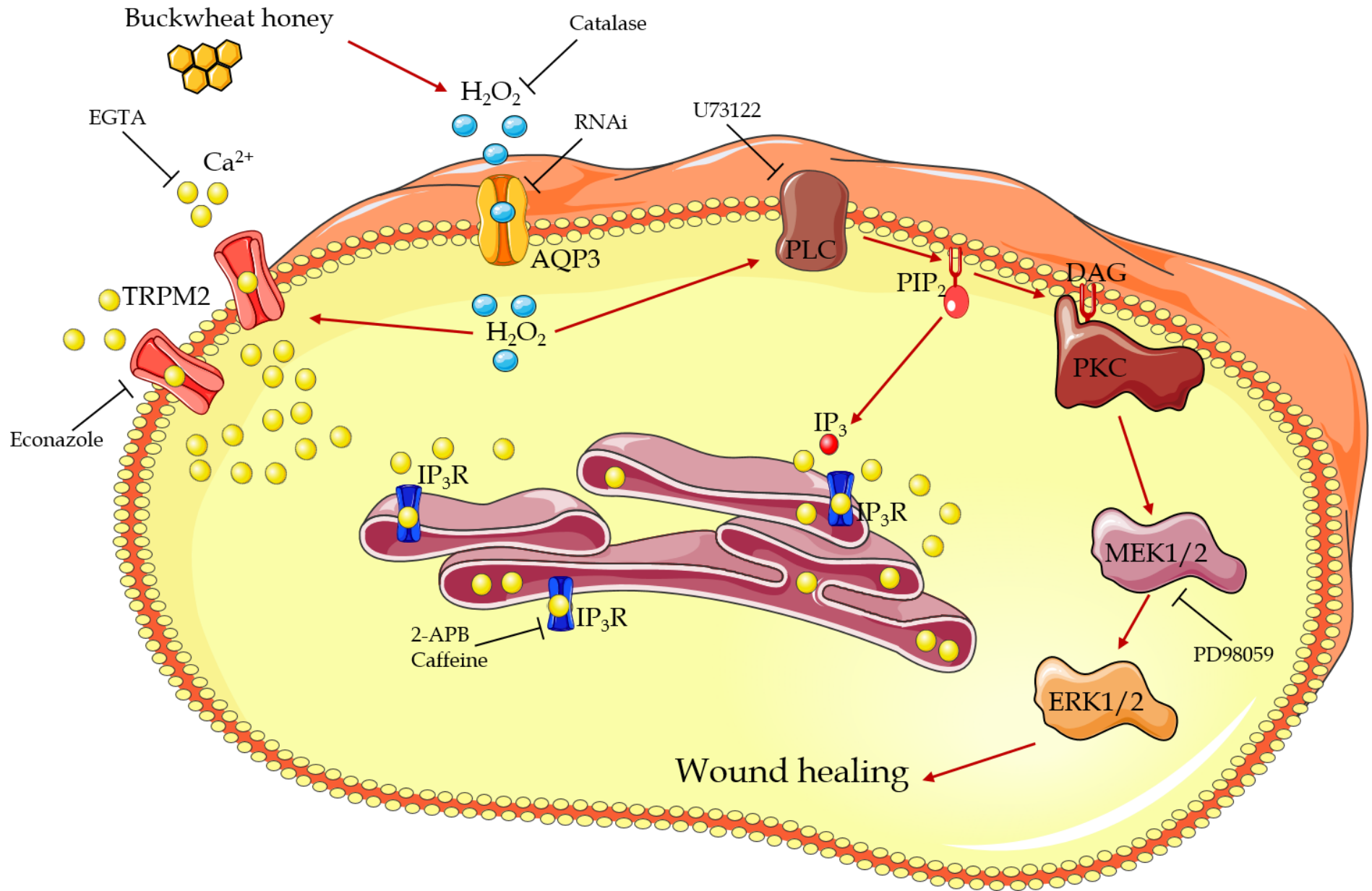


**B**



**D**






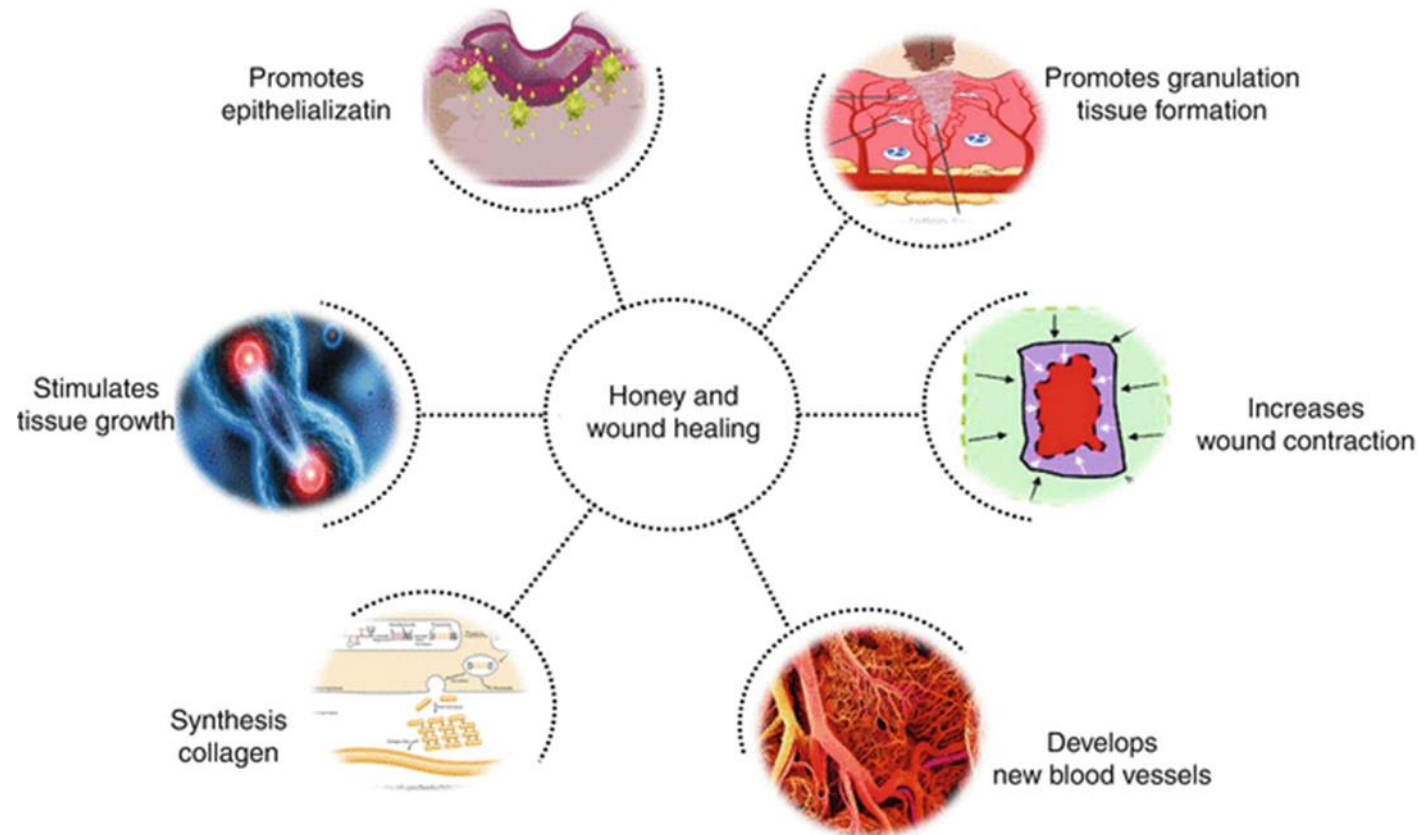
Ranzato *et al.*, Endothelial and vascular health: a tale of Honey,  $H_2O_2$  and Calcium, Cells 2021.

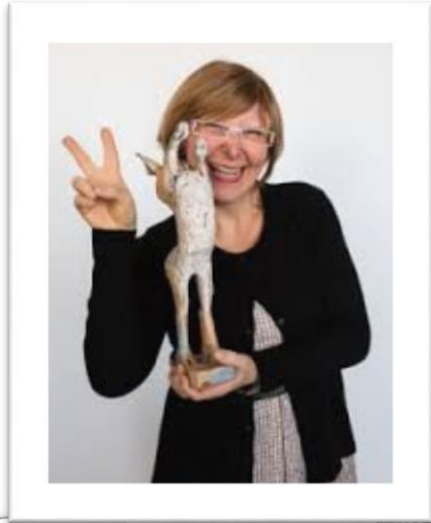


Review

# Honey, Wound Repair and Regenerative Medicine

Simona Martinotti <sup>1</sup> and Elia Ranzato <sup>2,\*</sup> 





ASSOCIAZIONE ITALIANA  
COLTURE CELLULARI



Comune di Cocconato AT

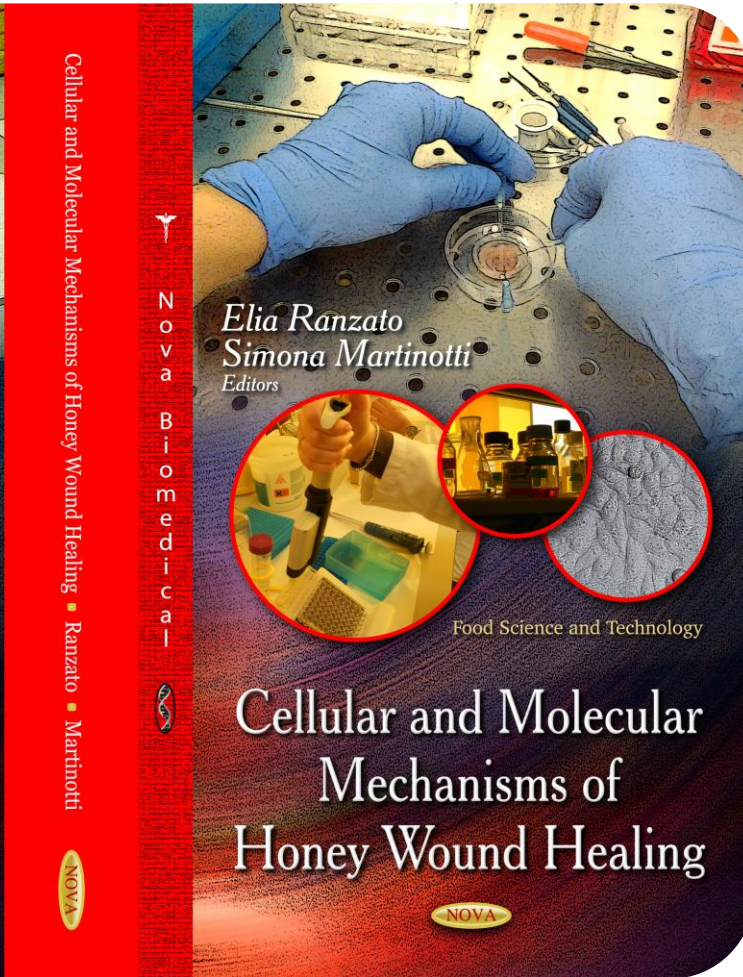
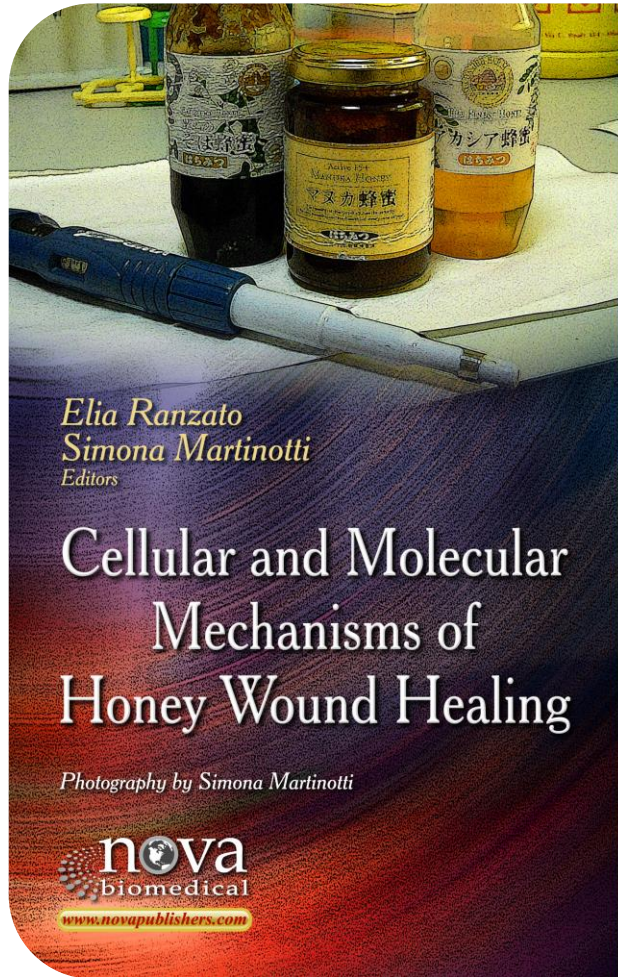
Croce Rossa Italiana  
Comitato di Cocconato

**CORSO BASE DI APITERAPIA**  
13 - 14 novembre 2021

 Yamada Research Grant



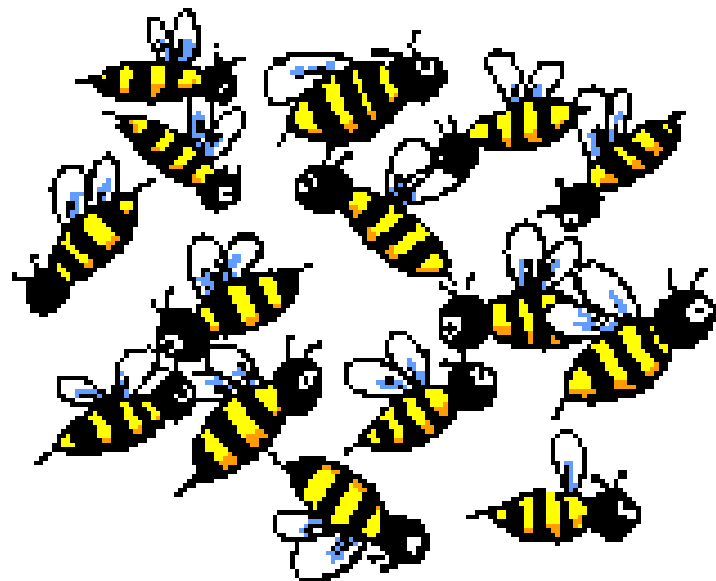




Two tablespoons of honey would fuel a honey bee flying once around the world



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