

# Slippery When Wet:

## Investigating the Effects of pH on Friction

Callie Thai, Emily Ngo, Lily Campbell, and Ozair Usmani

Mentor: Allison Chau

Pitenis Lab

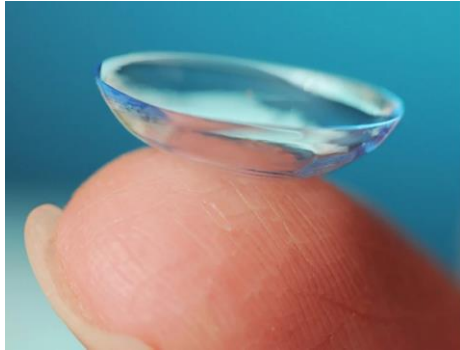


UC SANTA BARBARA  
Center for Science &  
Engineering Partnerships

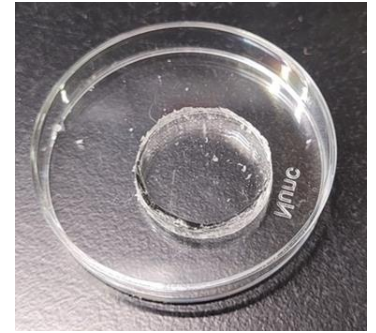
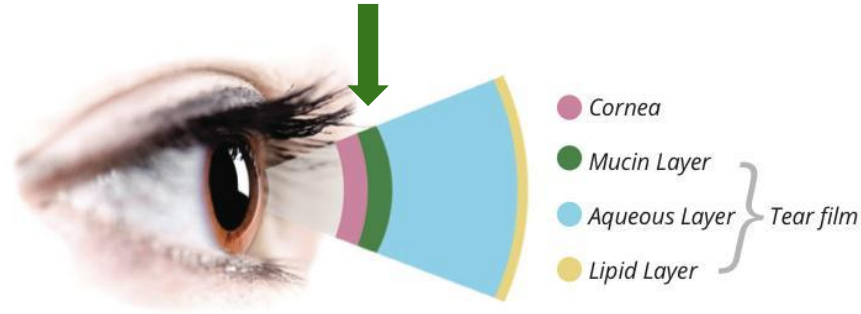


Interfacial  
Engineering  
Lab

# Contacts may disrupt the eye's mucin layer

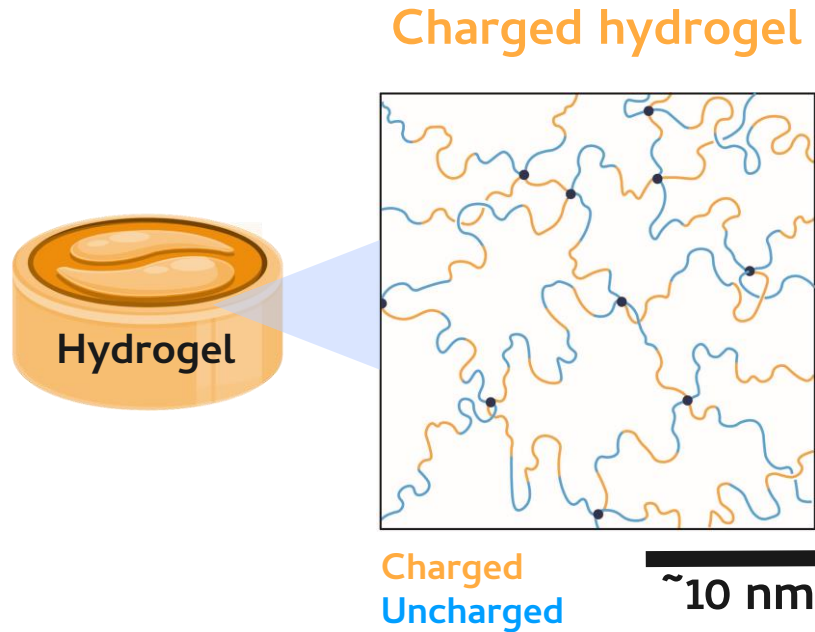


Contact



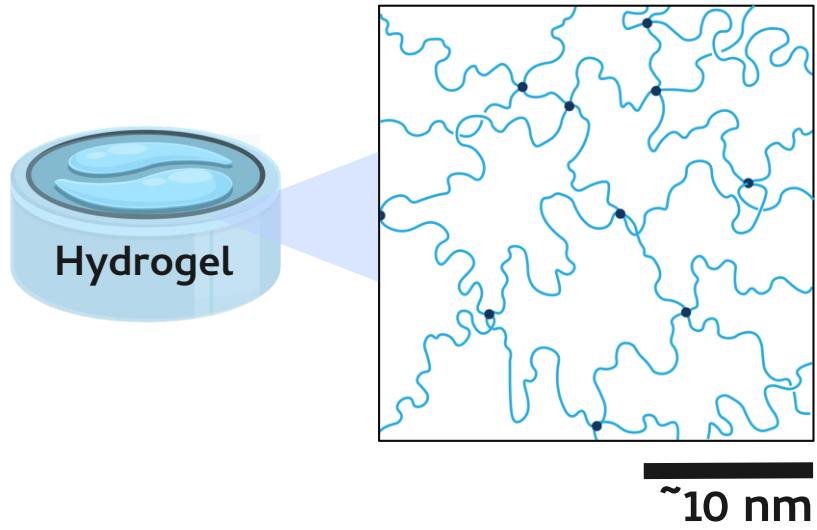
Hydrogel

# Charged hydrogels are pH responsive

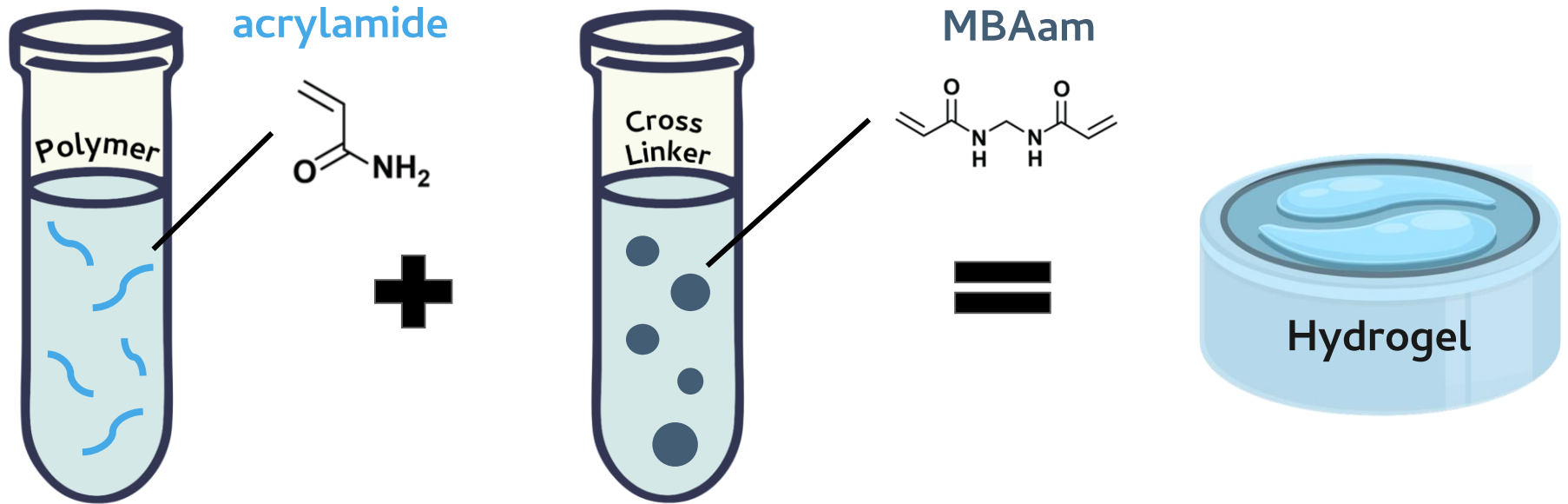


# Investigating effects of pH on uncharged hydrogels

## Uncharged hydrogel

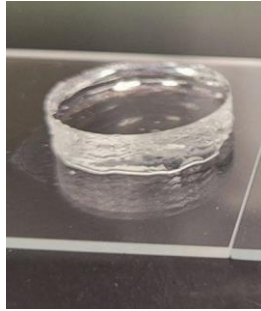


# Synthesizing uncharged hydrogels



# Hydrogels swell in different pH solutions

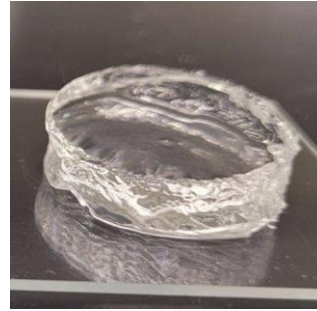
Acid



Neutral



Base

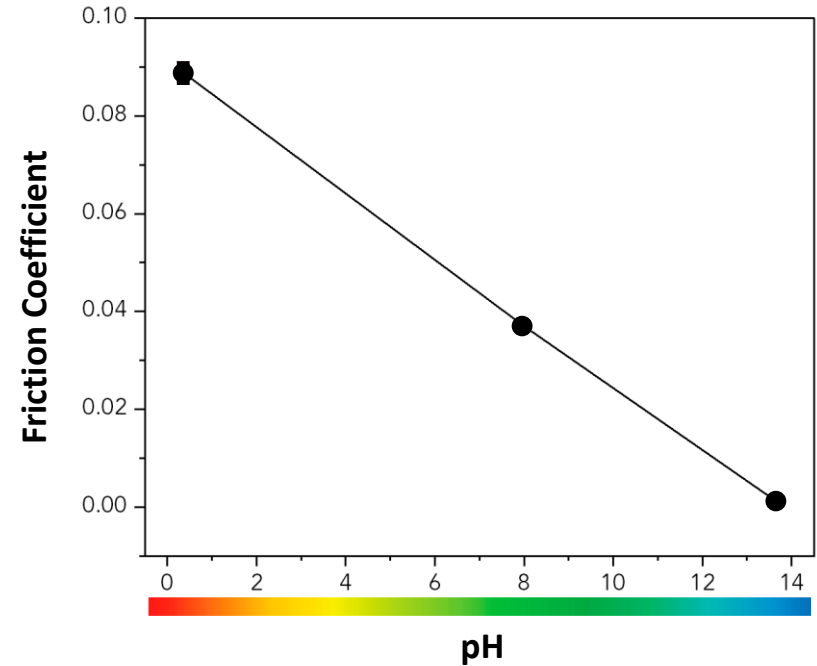
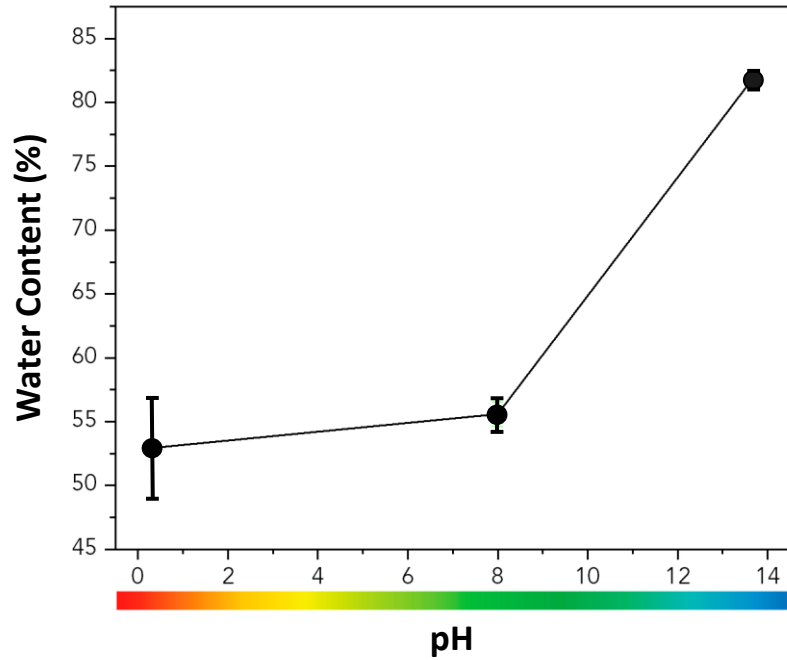


Low  
pH



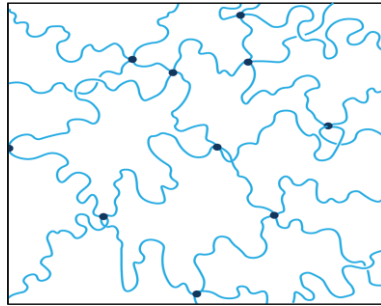
High  
pH

# Increase in swelling decreases friction of hydrogel

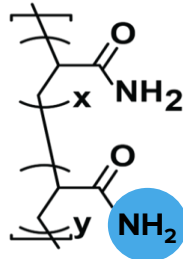


# Chemical reaction changes hydrogel structure

## Uncharged hydrogel



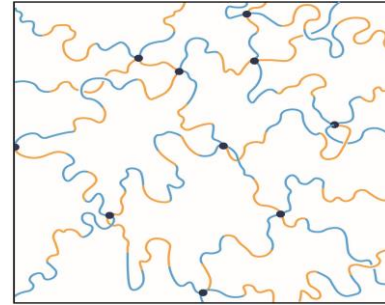
~10 nm



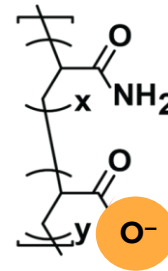
Hydrolysis



## Charged hydrogel



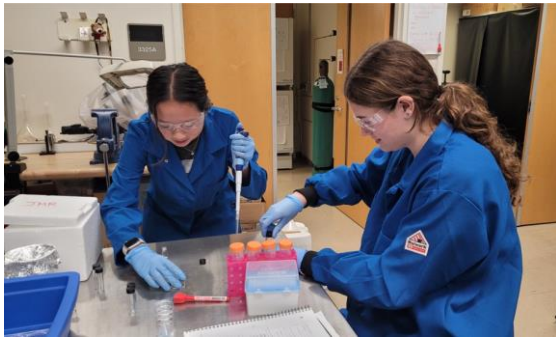
~10 nm



Charged  
Uncharged



# Improving hydrogels in everyday life



**Researching hydrogels**



**Drug delivery**



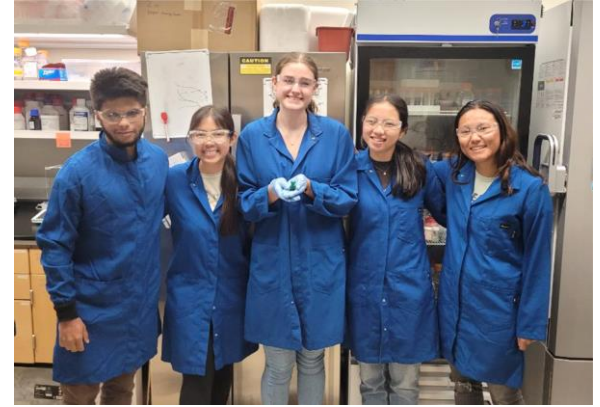
**Comfortable contacts**

# Acknowledgments

Dr. Angela Pitenis

Research mentor: Allison Chau

Peer mentor: Henry Dong



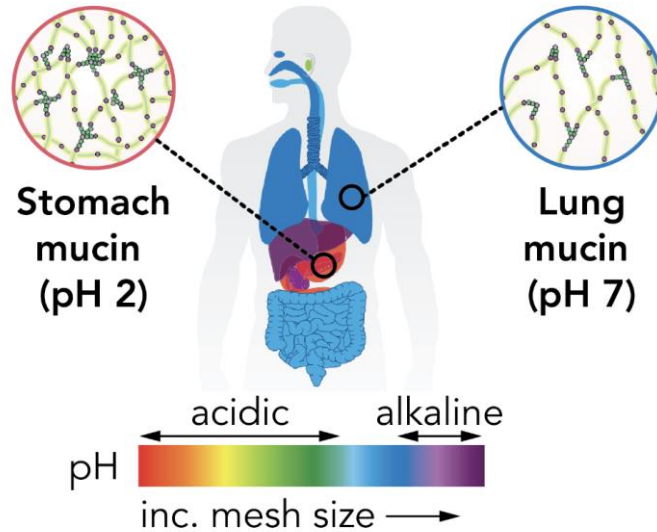
UC SANTA BARBARA  
Center for Science &  
Engineering Partnerships

SIMS



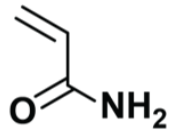
# Backup Slides

# Mucin layer is pH dependent

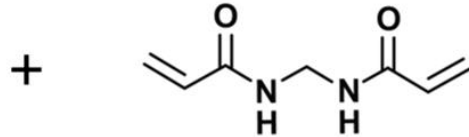


# Structure of polyacrylamide hydrogels

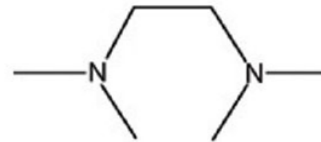
acrylamide  
(AAm)



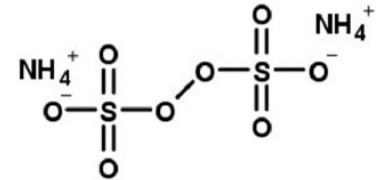
methylenebisacrylamide  
(MBAm)



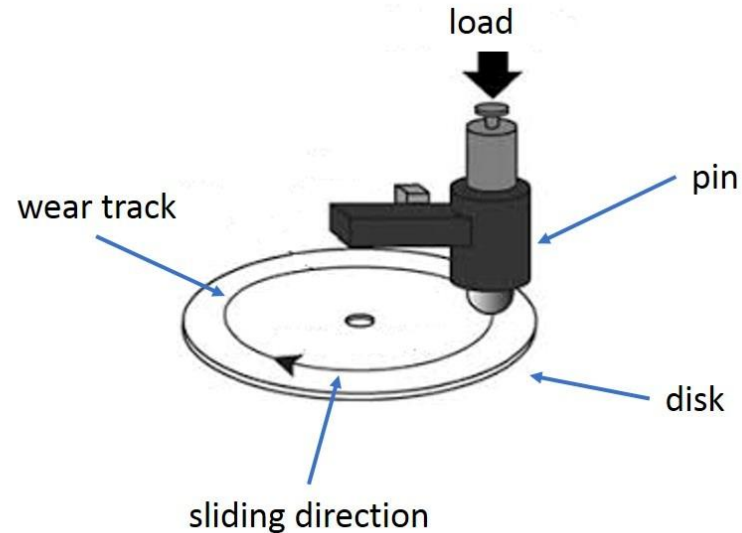
TEMED



APS



# Measuring friction with a tribometer



# Increase in swelling decreases friction of hydrogel

