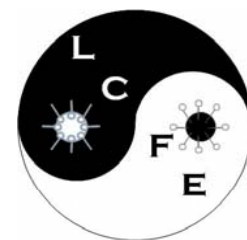


# Biocompatible Microemulsion Gels for the Delivery of Hydrophilic and Hydrophobic Active Ingredients

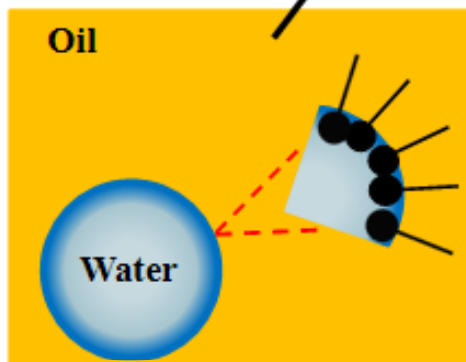
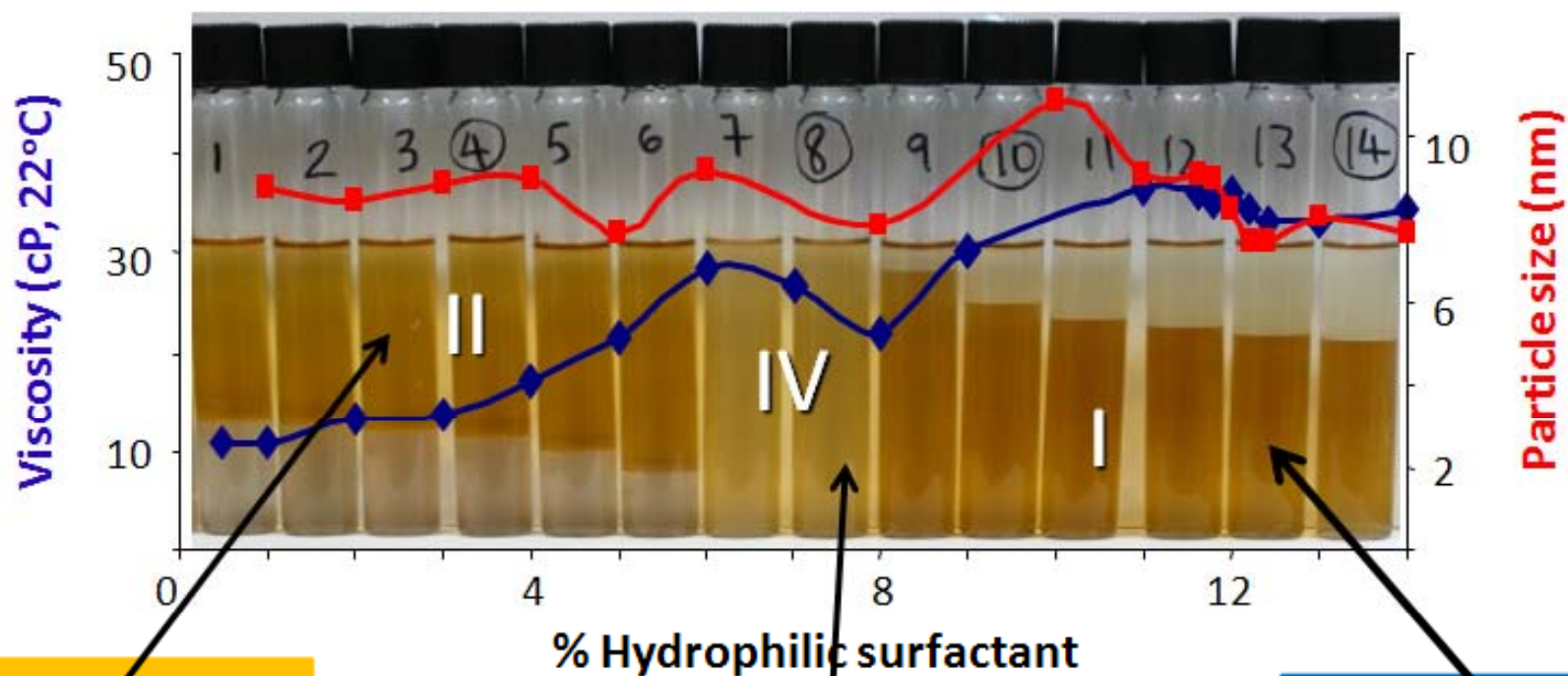
**Carol X. Xuan, O. Chung, E.J. Acosta, Y-L Cheng**

Department of Chemical Engineering and Applied Chemistry  
University of Toronto

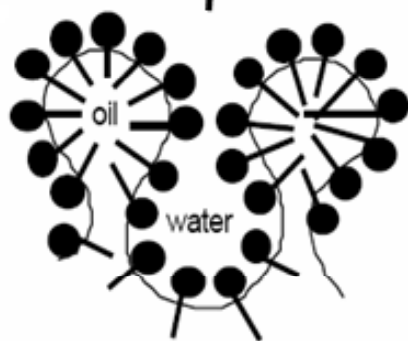
Society of Cosmetic Chemist Ontario Chapter Meeting  
May 26, 2011



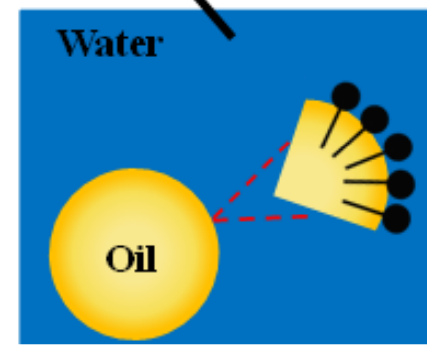
# Microemulsions ( $\mu$ Es)



Water-in-oil



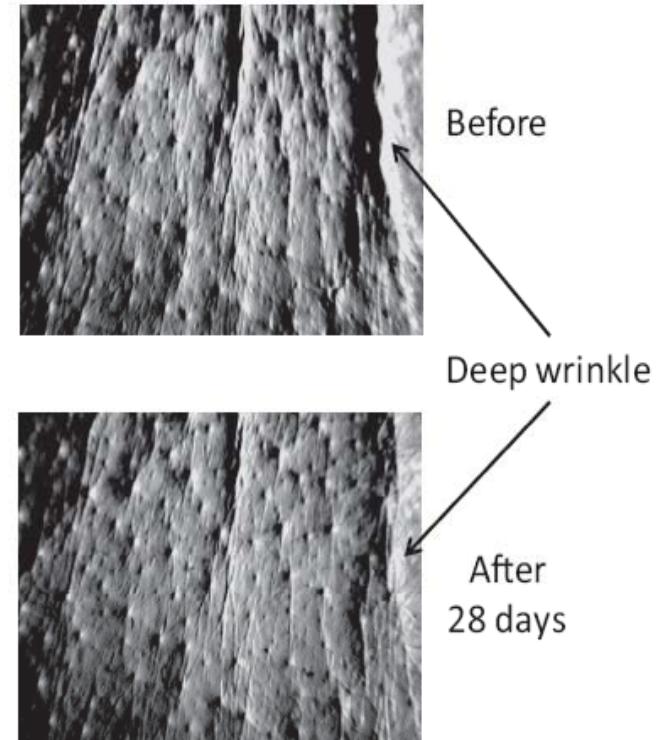
Bicontinuous



Oil-in-water

# $\mu$ Es for the Delivery of Actives

- Ability to co-solubilize hydrophilic and hydrophobic actives
- Enhancing skin permeation of active ingredients
- Novel low toxicity lecithin linker  $\mu$ Es by Yuan et al. for transdermal delivery



Pictures of the crows feet area of a volunteer at day 0 & day 28 after applying a linker lecithin  $\mu$ E containing 0.5% Deepaline PVB (anti-wrinkle active).

# Microemulsion Gels

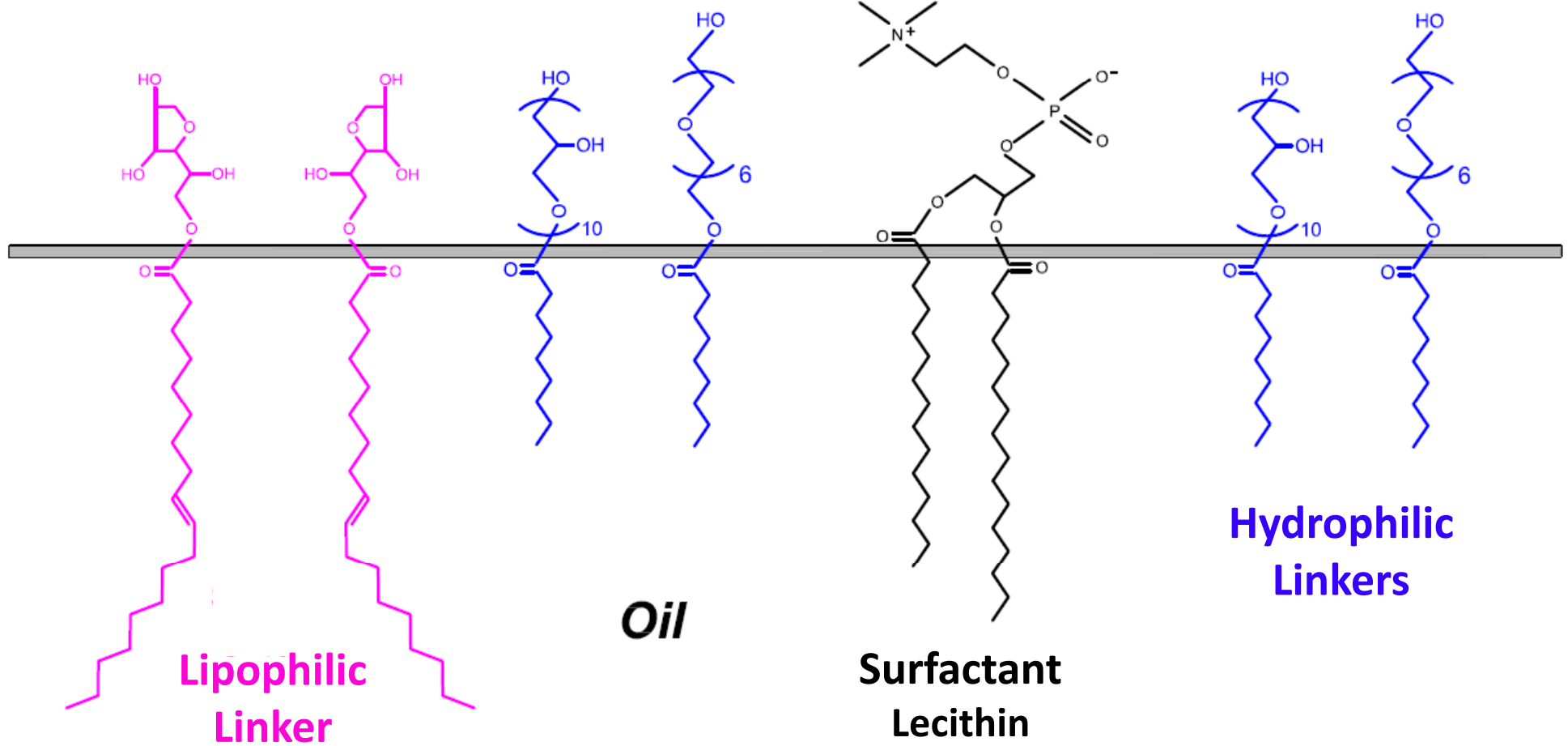
- Microemulsion gel =  $\mu\text{E}$  + gelling agent(s)
- Stimuli-responsive (temperature, pH, etc.)
- Possible gelling agents: gelatin, poloxamers, carbomer, gellan gum, etc.

# Objective

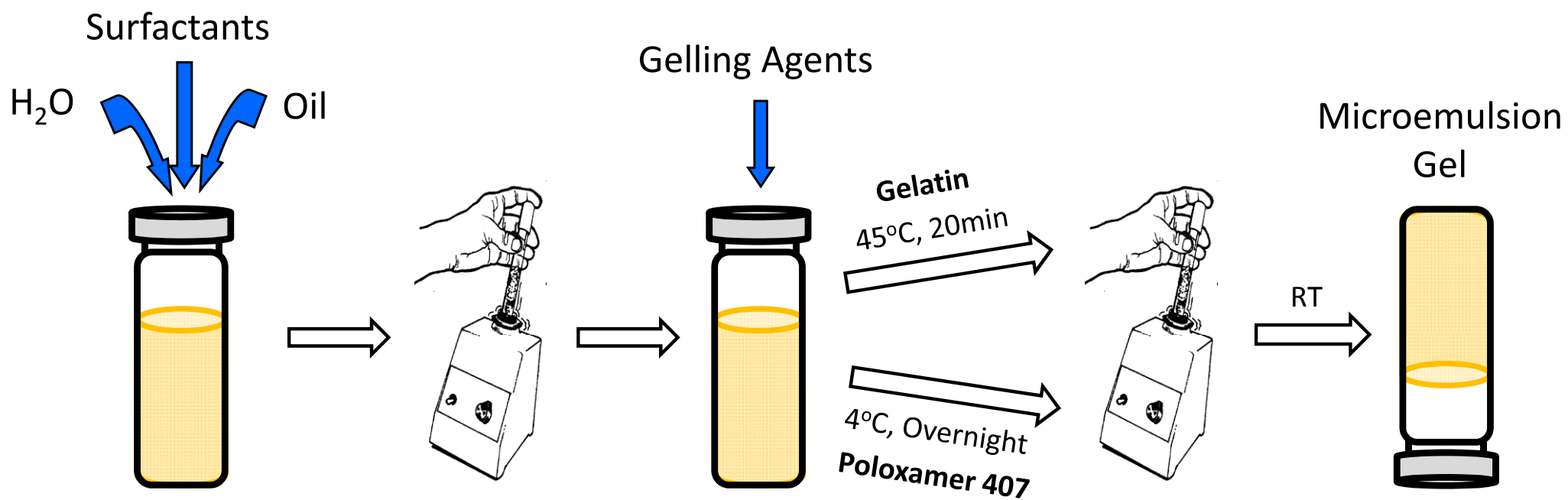
Modify the **viscosity** of low toxicity linker lecithin microemulsions using thermoresponsive viscosity modifying agents (**gelatin & poloxamer 407**)

# Microemulsion Components

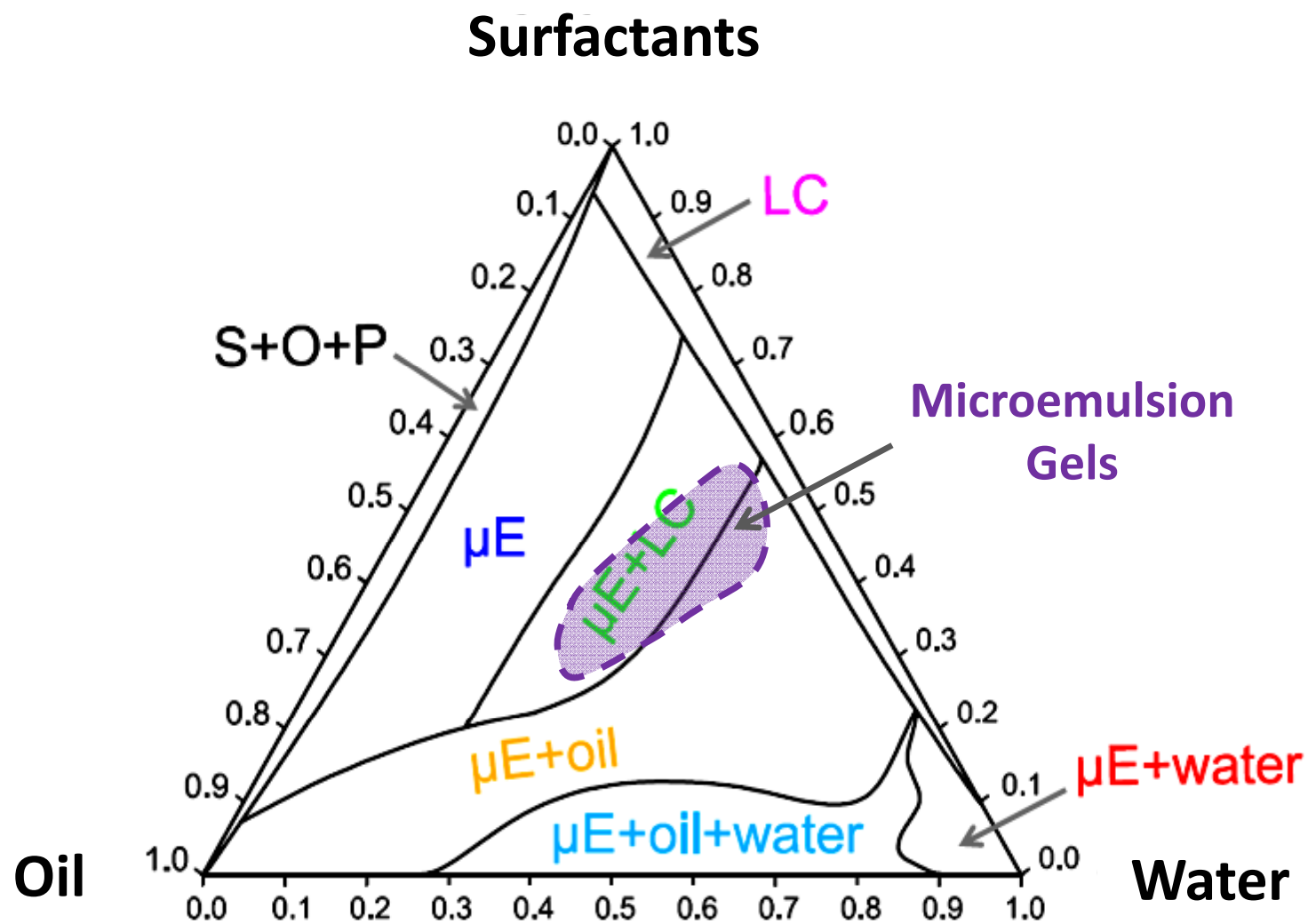
*Water*



# Methodology

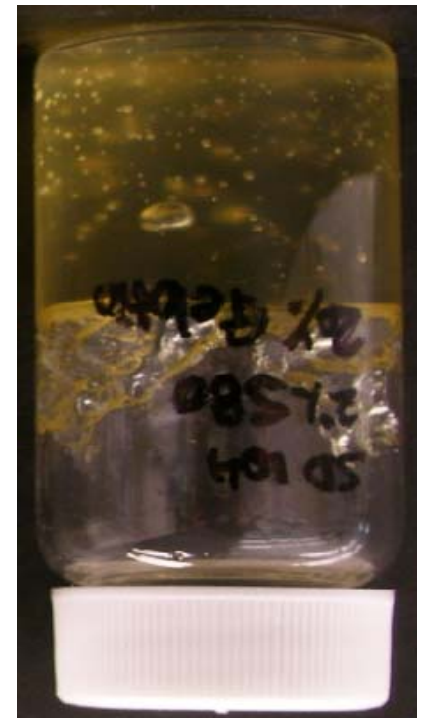


# Ternary Phase Diagram (25°C)



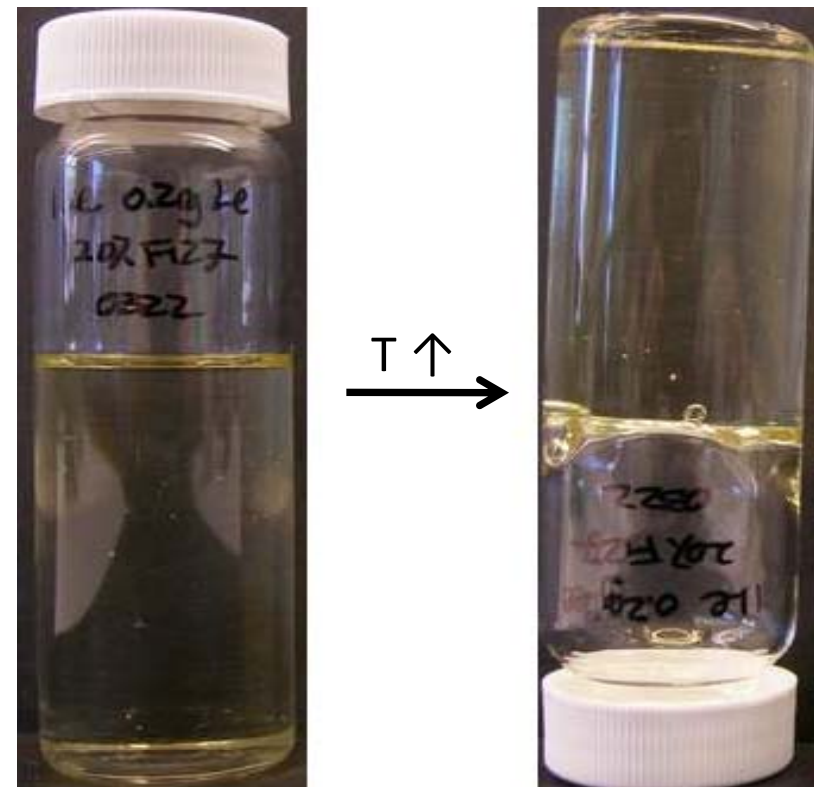
# Gelatin as Viscosity Modifying Agent

- Able to modify the viscosity of linker lecithin  $\mu$ E
- Produce thermoresponsive microemulsion gels at  $\sim 20\%$  w/w gelatin
  - Can incorporate  $\leq 40\%$  oil in the microemulsion gels
  - Can adjust gel hardness and opacity by varying oil, water or gelatin content

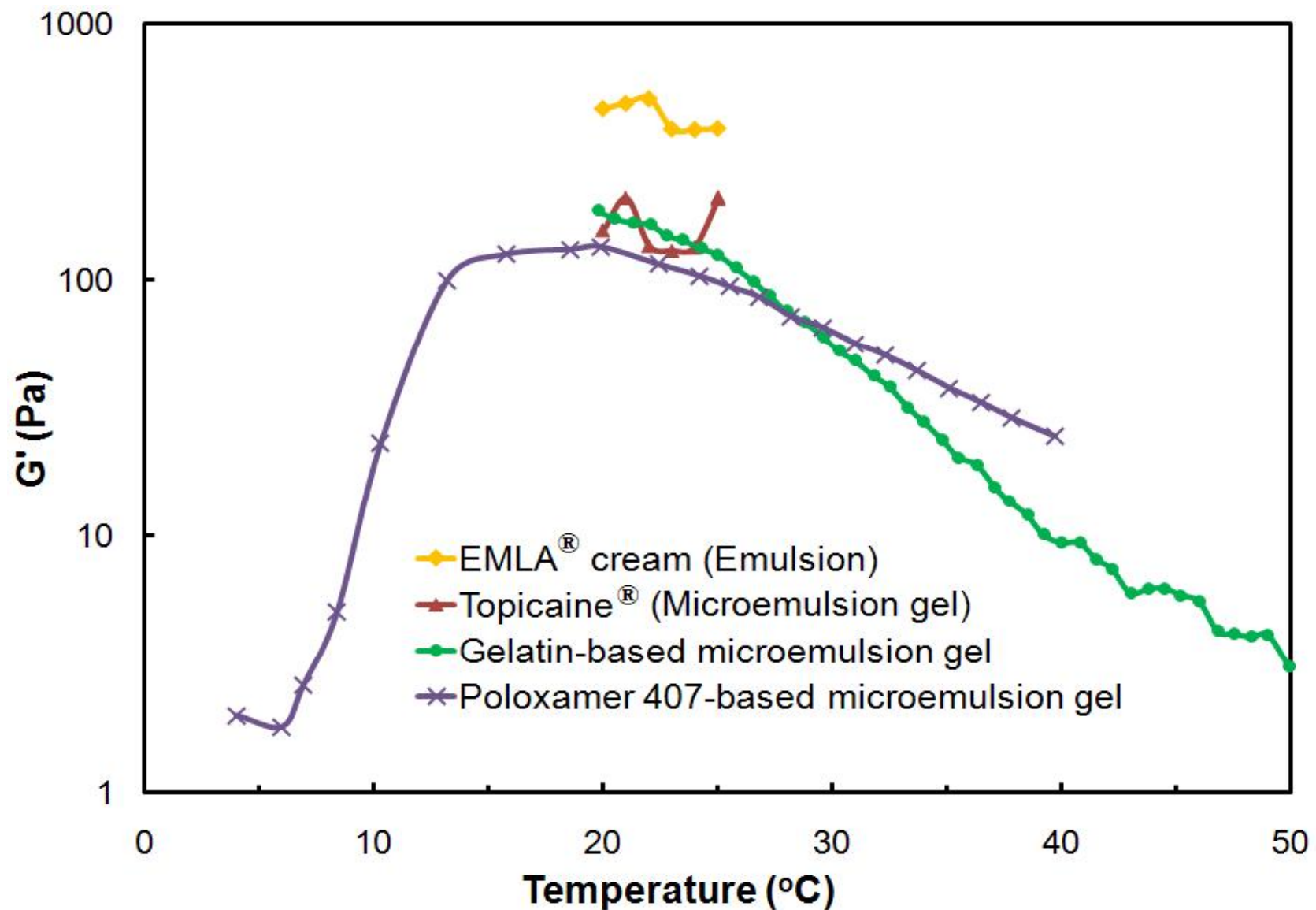


# Poloxamer 407 as Viscosity Modifying Agent

- Able to modify the viscosity of linker lecithin  $\mu$ E
- Produces thermo-responsive, transparent microemulsion gels at  $\sim$  20% w/w poloxamer 407
  - Can incorporate 10% oil
  - Shear thinning
  - “Shelf life” > 1 year



# Rheological Comparison



# Summary

- Viscosity of low toxicity lecithin-based linker microemulsions can be modified with addition of gelling agents such as gelatin and poloxamer 407
- Addition of 20 wt% gelatin or poloxamer 407 can produce thermoresponsive microemulsion gels
- Hardness and opacity of microemulsion gels can be adjusted by varying oil, water and gelling agent content

# Acknowledgement

- Mengyan Li (summer student)
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- Natural Sciences and Engineering Research Council of Canada 20/20 Ophthalmic Network

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# Thank You!



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