Fluorescence Lifetimes of Retinol in Different Lipid Phases

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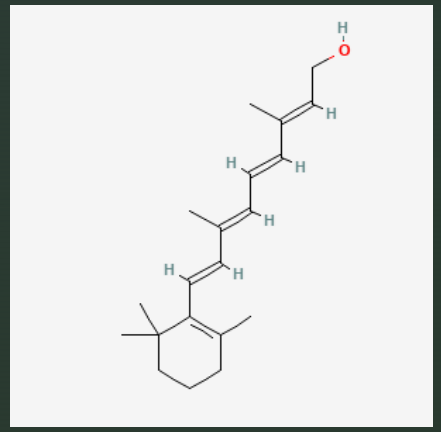
Overview

- Introduction
  - Retinol's Properties
  - Liposomes and Retinol Encapsulation
  - FLIM and FLS
- Methods
- Results
- Discussion
- Conclusions

Retinol's Properties

- Retinol, or Vitamin A, has important pharmaceutical and cosmetic applications
- It degrades readily when exposed to light or oxygen
- It's fluorescent



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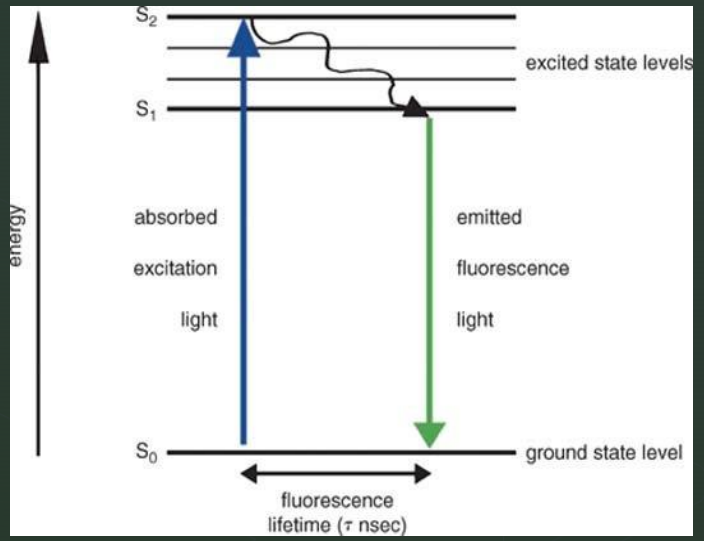

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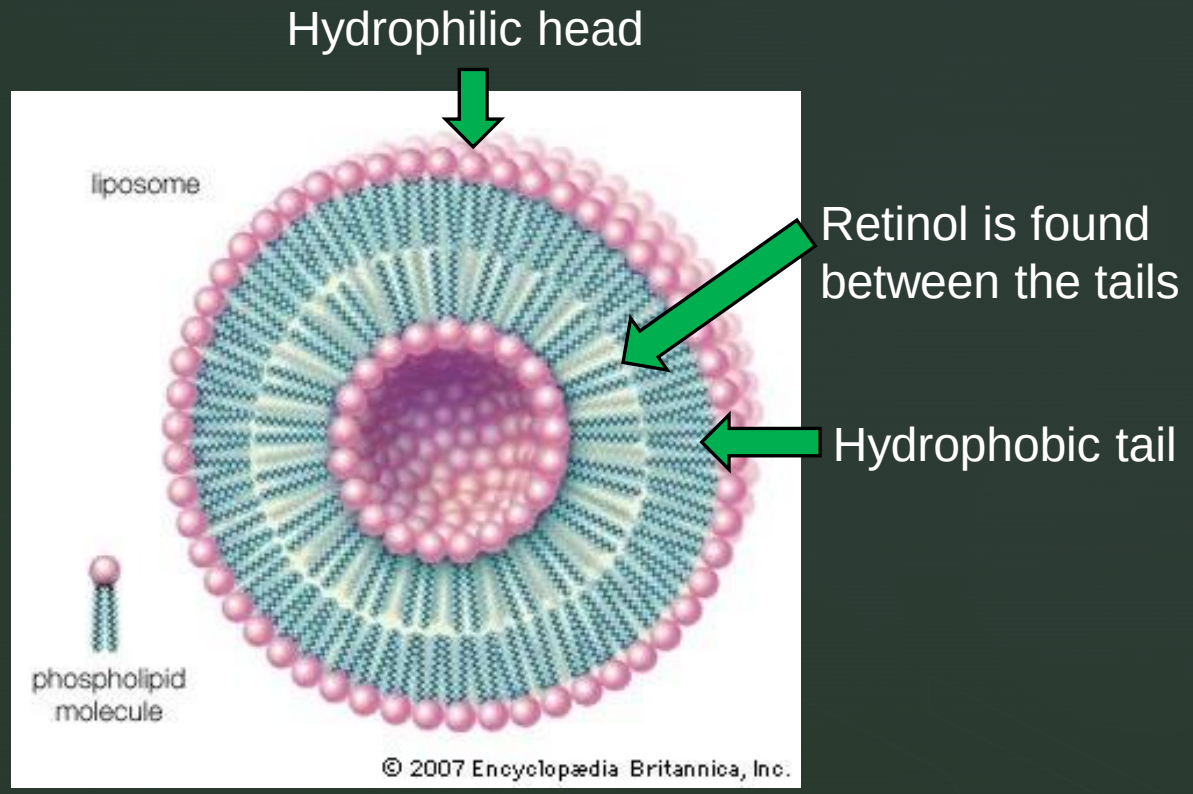
Liposomes and Retinol Encapsulation

- Liposomes are vesicles that consist of lipid bilayers
- Encapsulation minimizes oxygen and light exposure preventing degradation



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FLIM and FLS

- FLIM images on the microscopic scale to determine the fluorescence lifetime of specific regions of the liposome

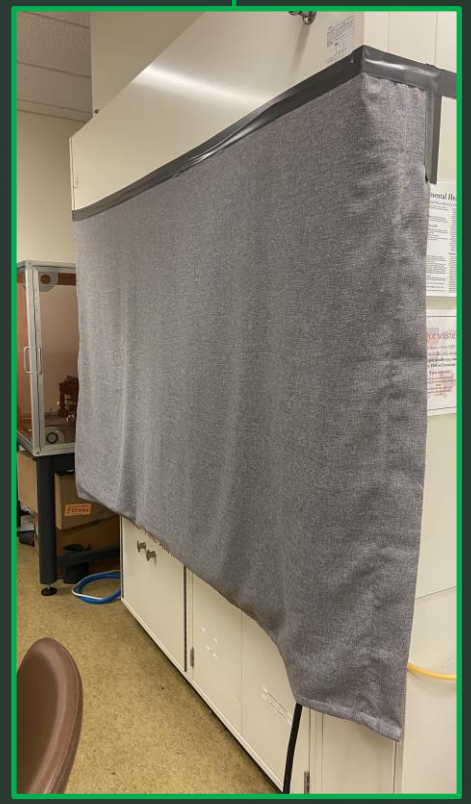
Image credit from OHSU

- FLS determines bulk time resolved measurements of liposomes in an aqueous solution

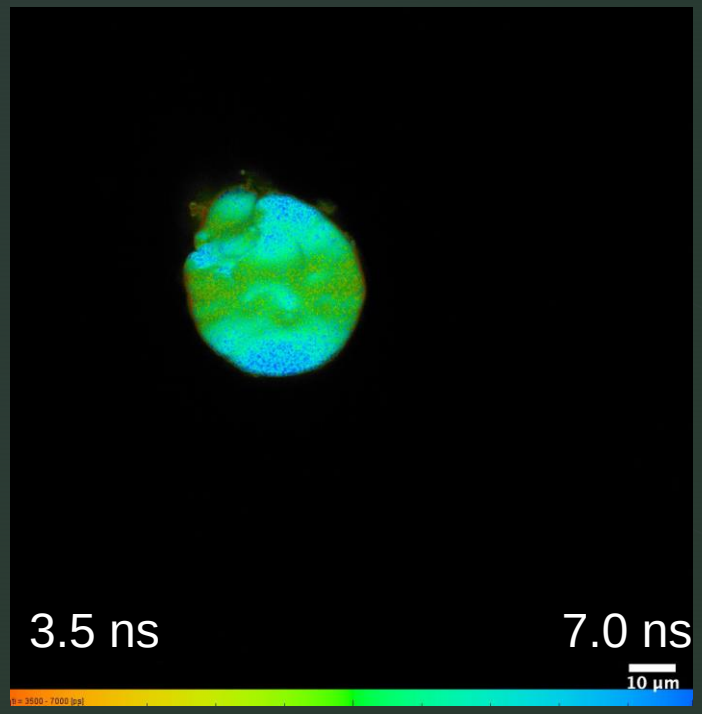
Image credit from ISS

Methods

Combine lipids and retinol in the dark → Evaporate solvents → Lyophilize → FLIM / Extrude → FLS

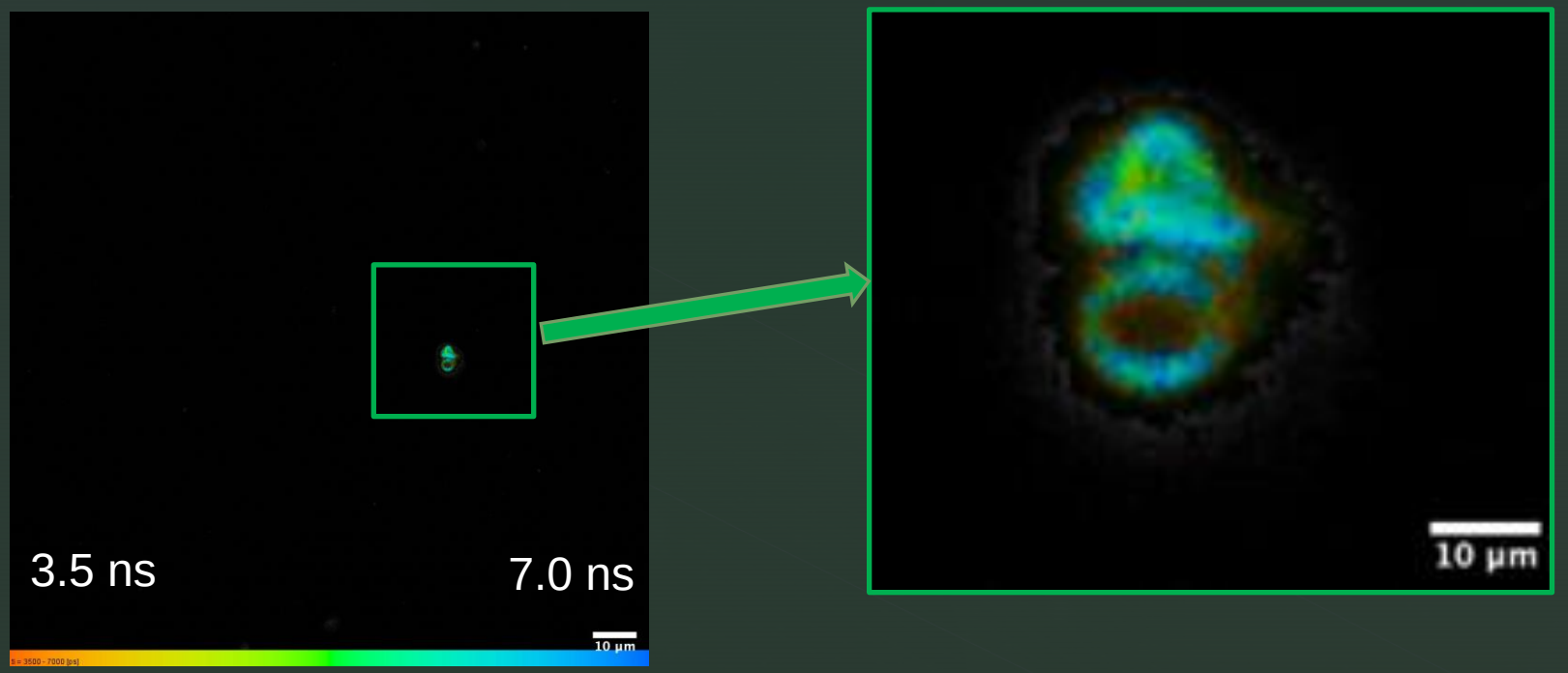


FLIM Measurement of POPC Liposome #1



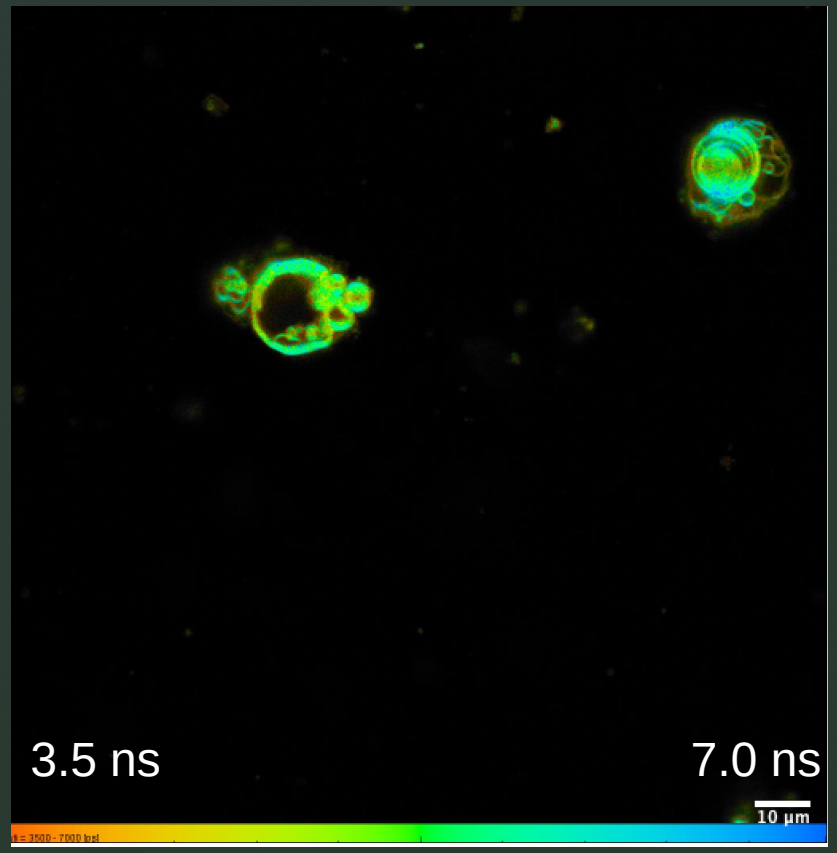
- Lifetimes ranged from 6.3 to 8.0 ns based on ROIs
- There were small variations in lifetime amongst the regions
- Consistent lamellarity

FLIM Measurement of POPC Liposomes #2



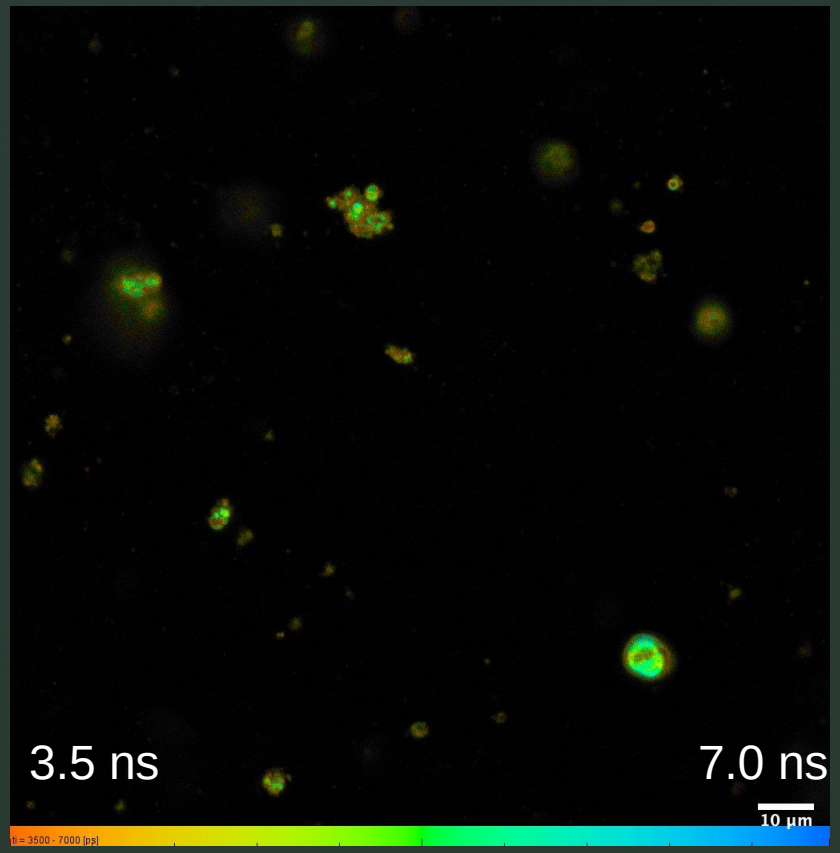
- Lifetimes ranged from 6.8 to 7.2 ns
- There were minimal variations in lifetime amongst the regions
- Inconsistent lamellarity

FLIM Measurement of POPC Liposomes with 10 molar percent cholesterol #1



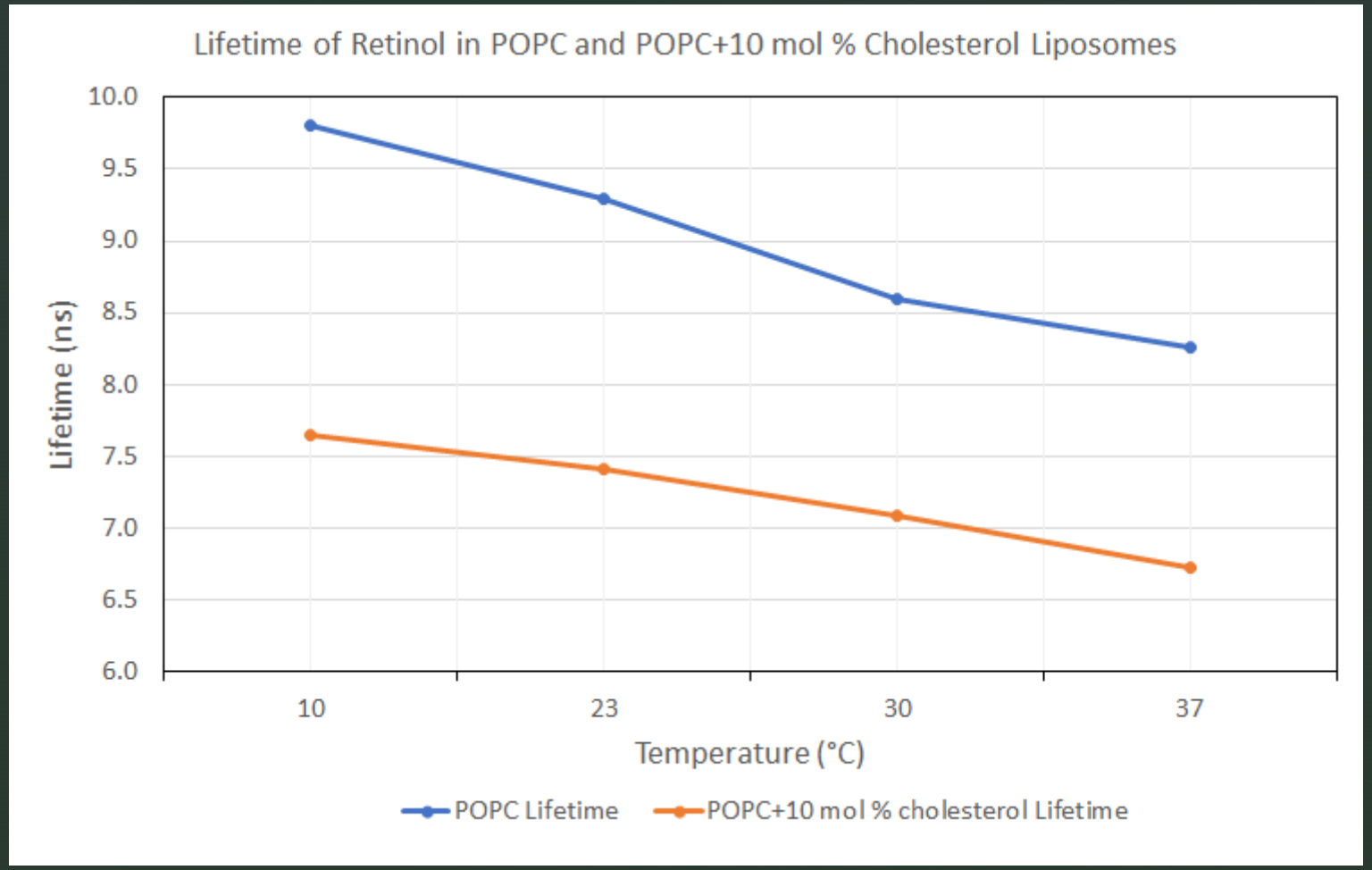
- Lifetimes ranged from 6.8 to 7.1 ns based on ROIs
- Lamellarity was inconsistent in the liposome to the left

FLIM Measurement of POPC Liposomes with 10 molar percent cholesterol #2



- Lifetimes ranged from 6.2 to 6.8 ns based on ROIs
- Consistent lamellarity
- Size of the liposomes varied

FLS Measurement



- As temperature increased, lifetime decreased

Discussion

- Fluorescence lifetimes were greater for POPC liposomes from both FLIM and FLS measurements
- As temperature increased, lifetimes decreased
- Careful handling of retinol contributed to improved results

Conclusion

- Stability of retinol was improved in the POPC liposomes more than in the POPC+10 mol % cholesterol liposomes
- As disorder in the lipid bilayer increases, stability decreases based off these preliminary results
- Further work with different amounts of cholesterol and lipids with saturated fatty acid tails are recommended

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