

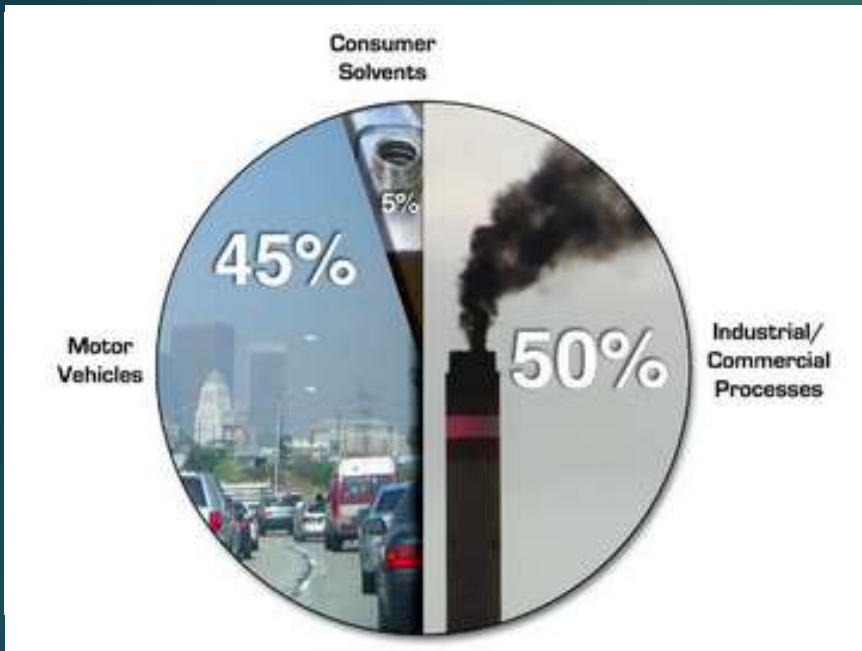


# Assessment of Cardiac Function in Mice Chronically Exposed to Volatile Organic Compounds

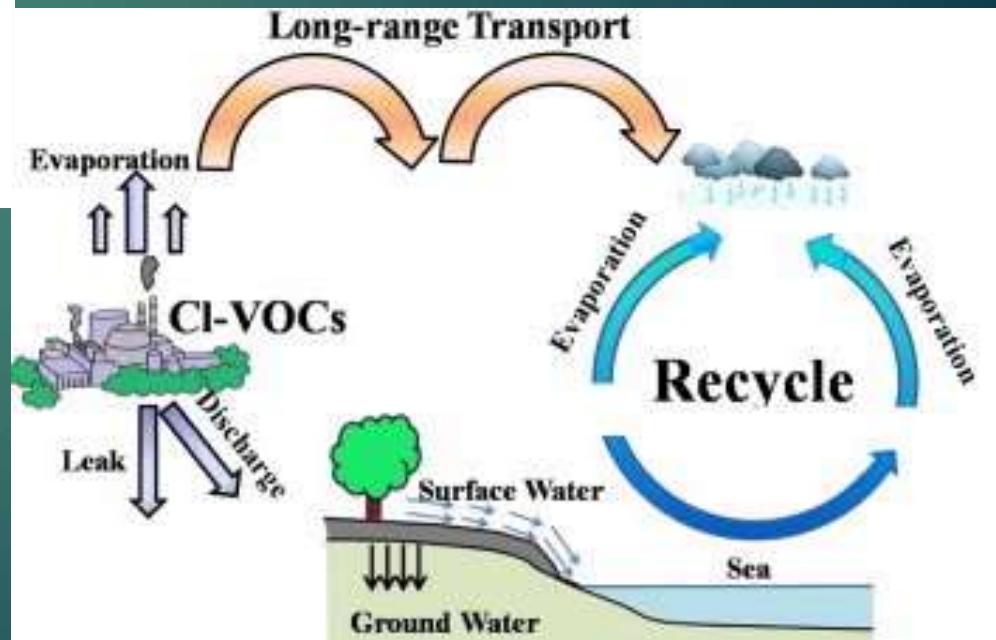
Presenters: Jessica O'Neal, Benjamin Sabat, Gabriel Rodrigues

Faculty Members: Bud Chew, Ph.D.; Jun Ren M.D./Ph.D.

# Locations of VOCs



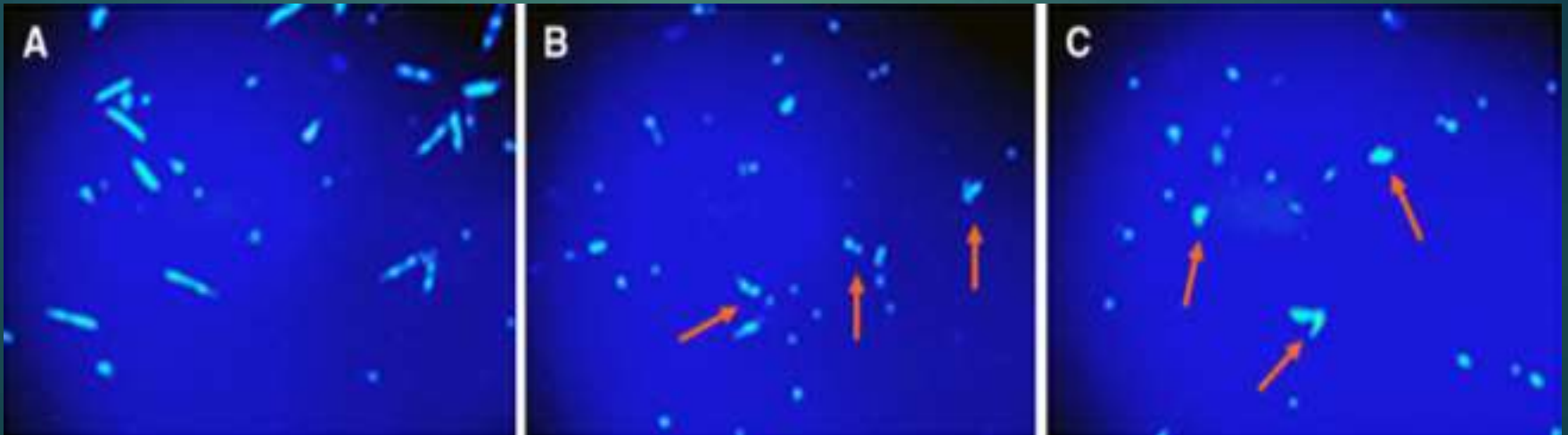
Source: <https://science-edu.larc.nasa.gov/ozonegarden/ozone.php>



source: Environ Int. 2014 Oct;71:118-38. doi: 10.1016/j.envint.2014.06.013. Epub 2014 Jul 11.

# Acrolein Exposure *in vitro*

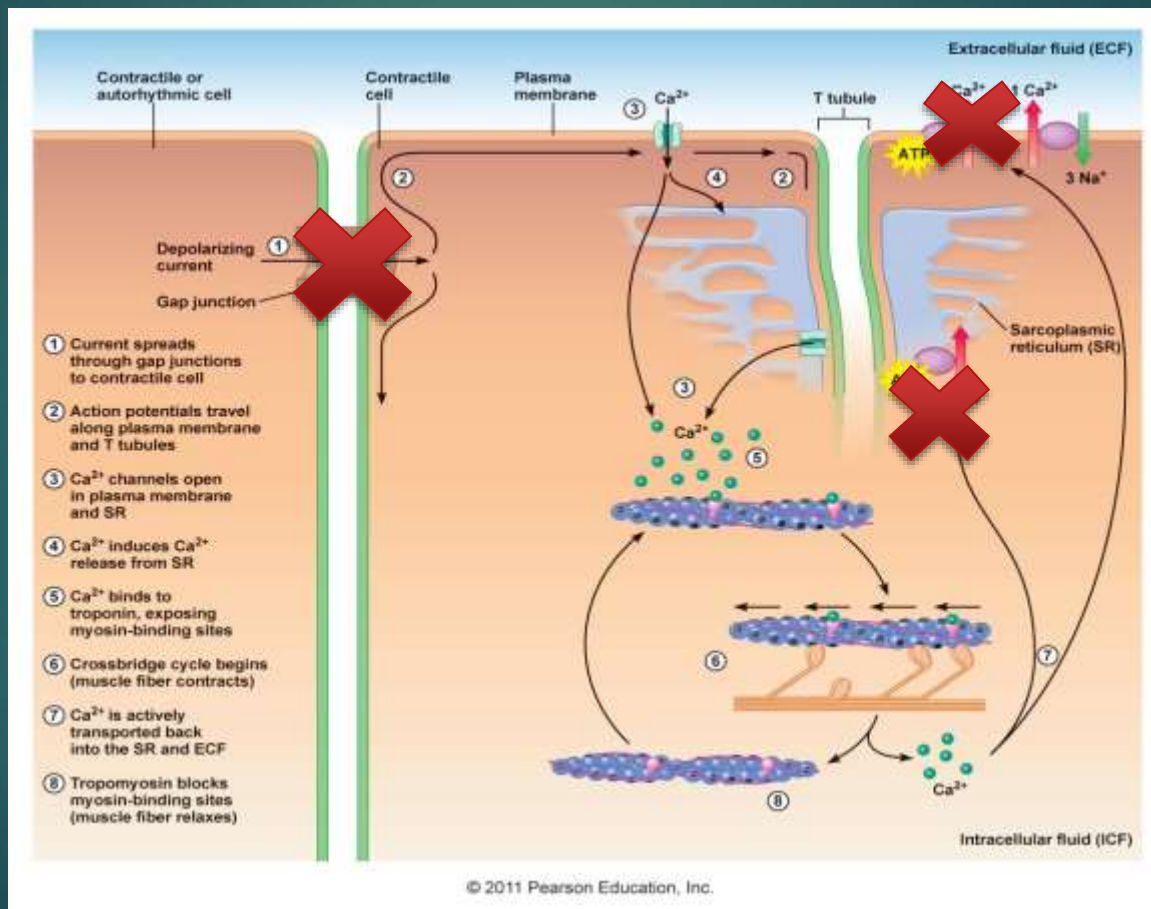
- ▶ Acrolein exposure results in the release of oxygen free radicals (Wang, 2011).
- ▶ Oxygen free radicals cause:
  - ▶ Damage to cardiomyocyte DNA
  - ▶ Inhibits electron transport and ATPase



(Wang, 2011)

# Polyvinyl Chloride (PVC)

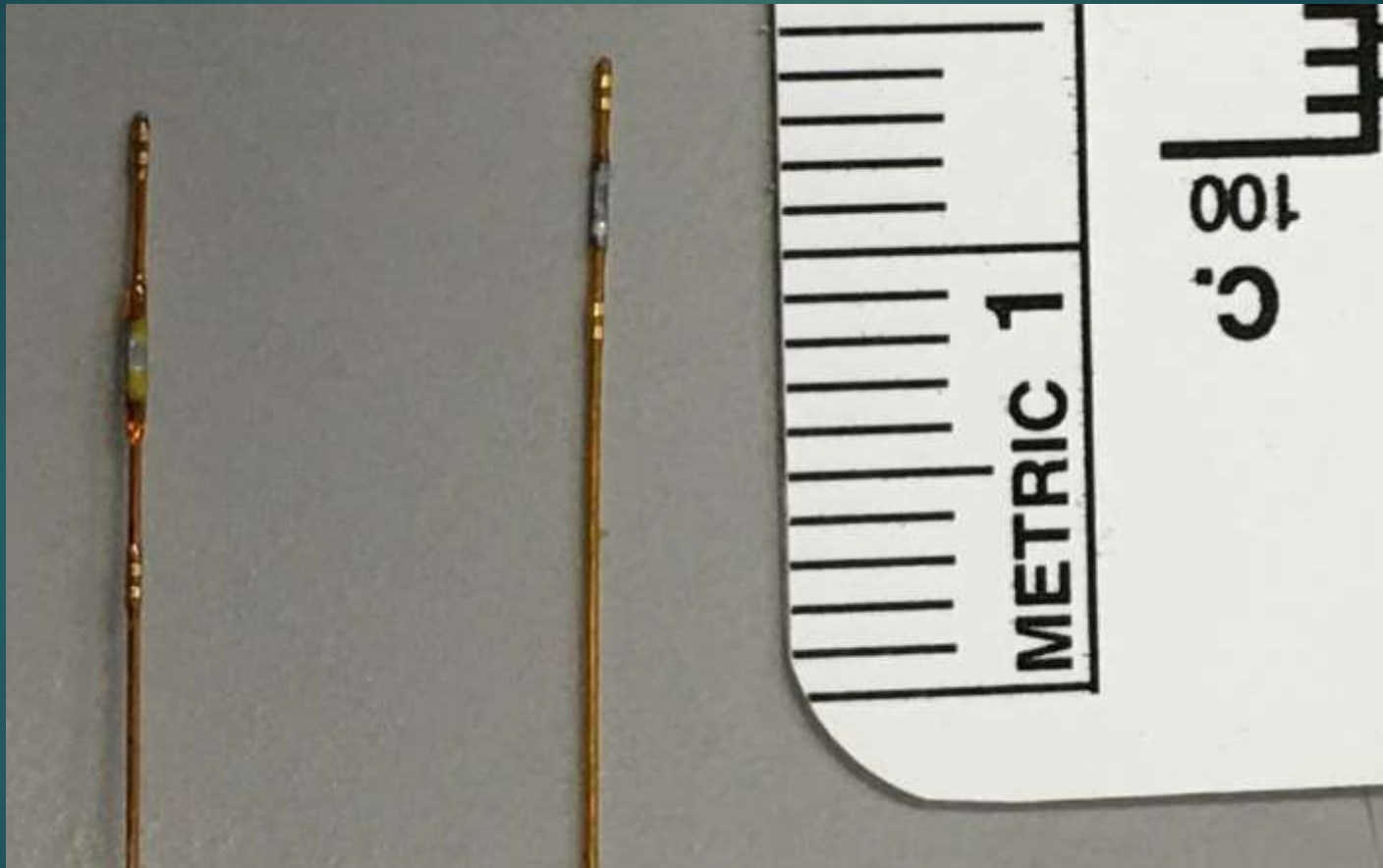
- ▶ Di-2-ethylhexyl-phthalate (DEHP) is a common plasticizer used in PVC products.



# VOC Exposure and Heart Function *in vivo*

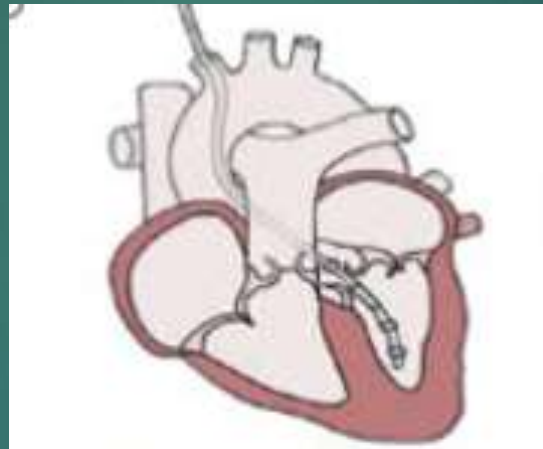
- ▶ We hypothesize that mice chronically exposed to aerosolized acrolein and/or polyvinyl chloride for 5-6 weeks will develop cardiac dysfunction *in vivo*.
- ▶ Collaborative project with Dr. Jun Ren, UW Pharmacy School
  - ▶ Recently approved by NIH and UW IACUC
  - ▶ Mice exposed in Dr. Ren's lab
  - ▶ Pressure-volume loop analysis of heart function will begin in Fall of 2017

# Pressure-Volume Transducers



Rat (left) and Mouse (right) Pressure-Volume Transducers

# Pressure-Volume Loop Procedure



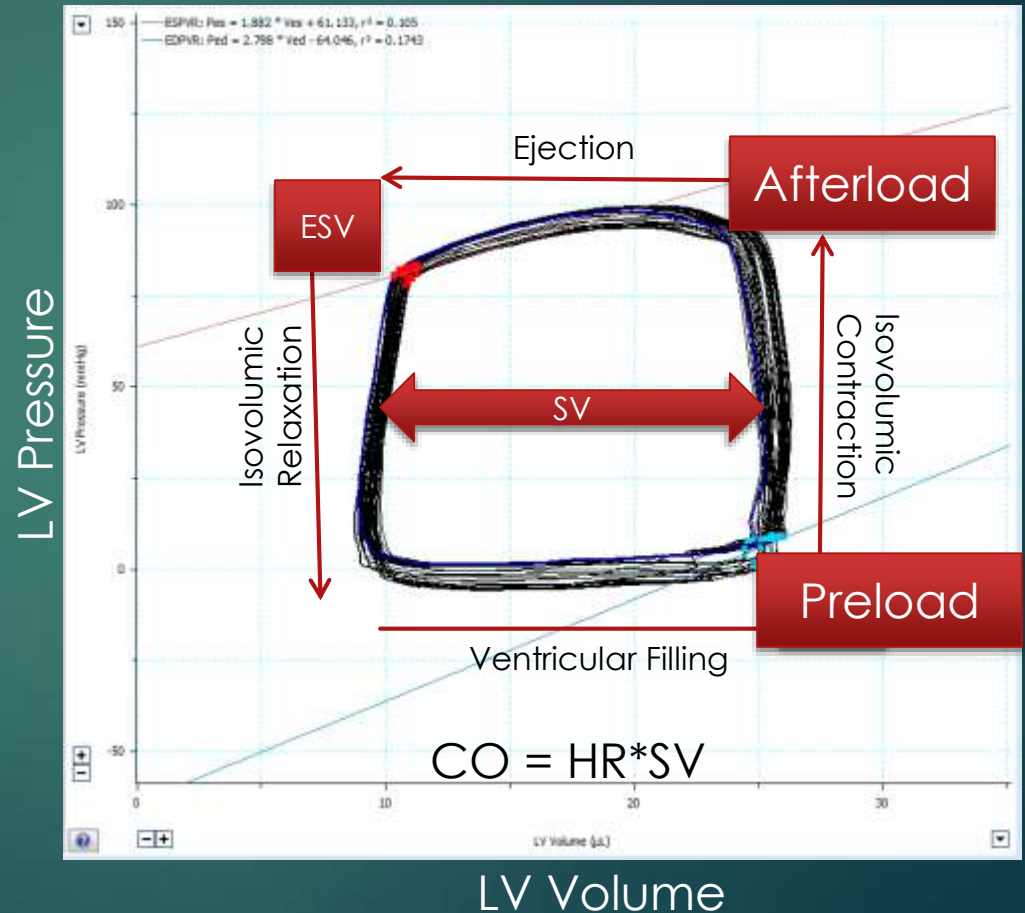
Pacher, P., Nagayama, T., Mukhopadhyay, P., Bátkai, S., & Kass, D. A. (2008). Measurement of cardiac function using pressure-volume conductance catheter technique in mice and rats. *Nature Protocols*, 3(9), 1422-1434. doi:10.1038/nprot.2008.138

# Pressure-Volume Loops

Measured parameters of heart function:

▶ Cardiac Output (CO)

- ❑ Heart Rate (HR)
- ❑ Stroke Volume (SV)
  - ❖ Preload
  - ❖ Afterload
  - ❖ Contractility

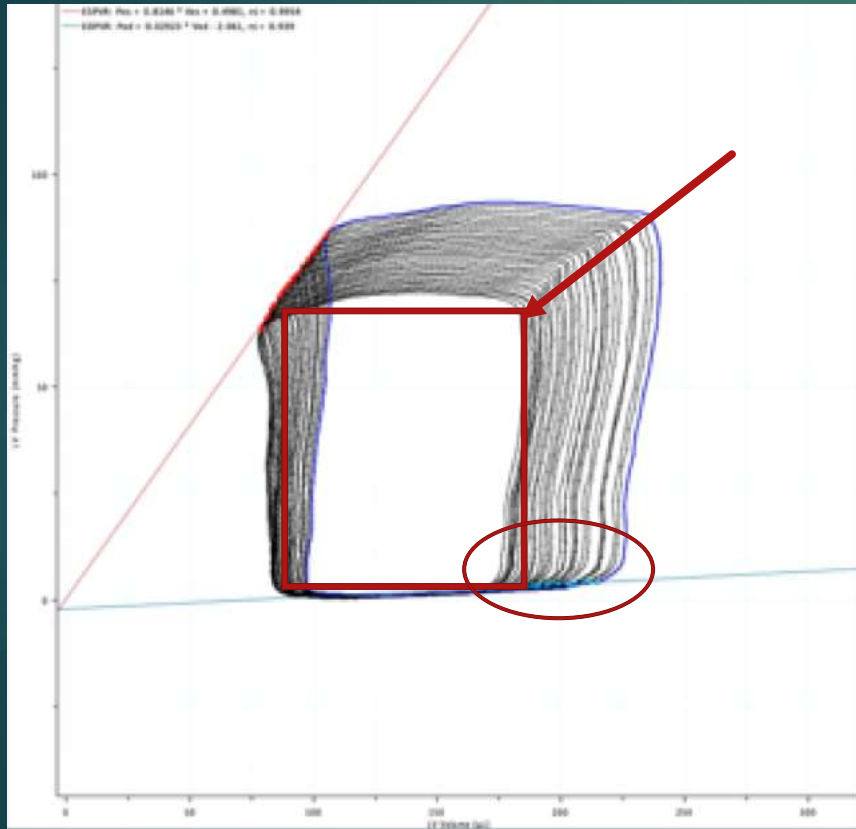




# Preload-Recruitable Stroke Work via IVC Occlusion



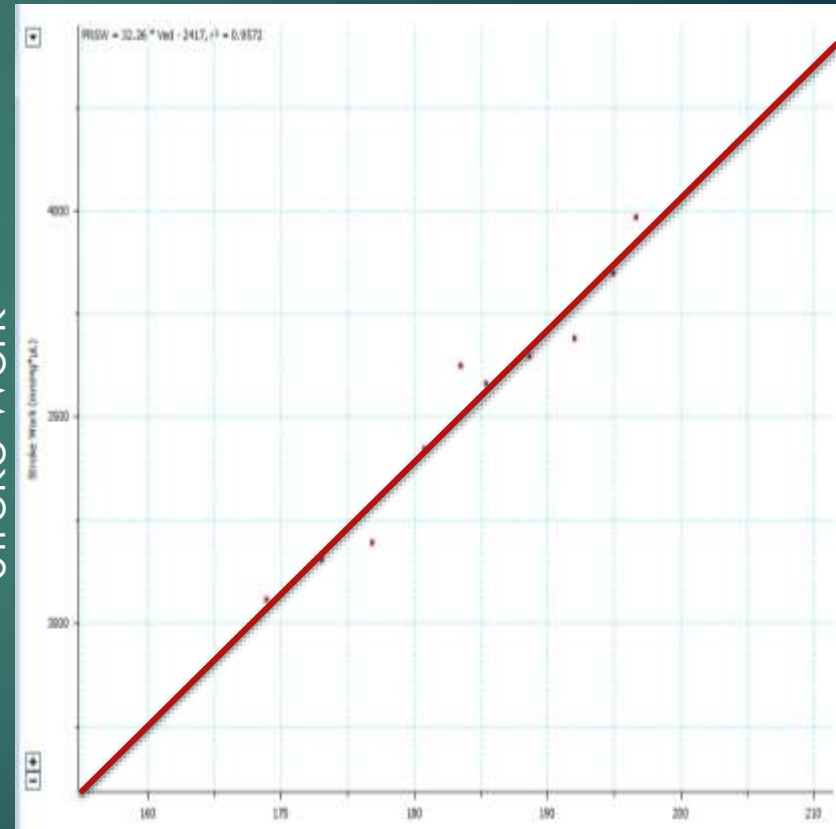
Pressure



Volume

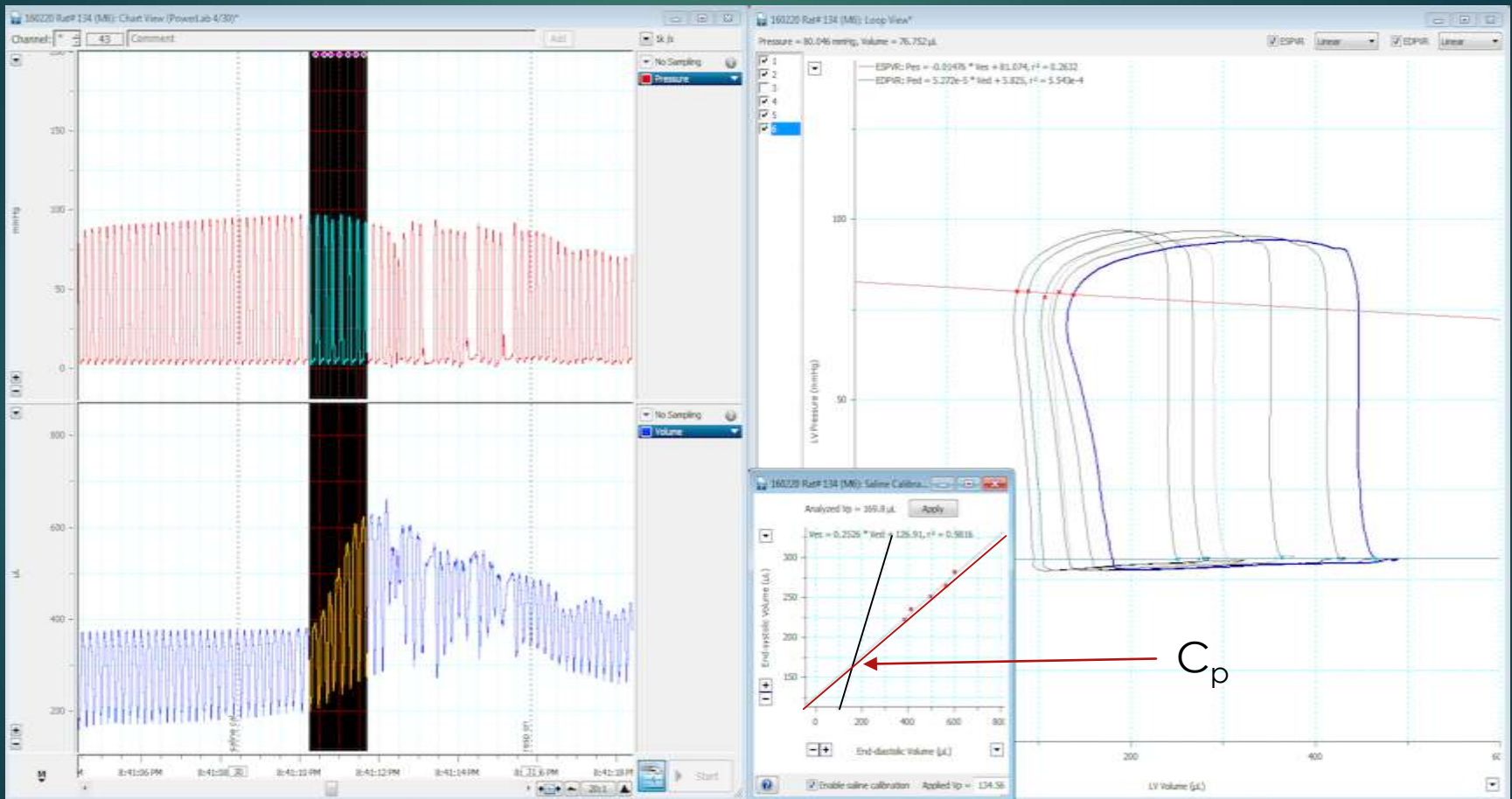
PRSW Plot

Stroke Work



EDV

# Subtraction of Parallel Conductance via Saline Calibration



# Volume Units Conversion via Cuvette Calibration



We Are Excited To Begin Data  
Collection In The Fall!



# Acknowledgements



- This project was supported in part by grants from the National Institute of General Medical Sciences (P20GM103432) at the National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.
- Dr. Jun Ren for continued collaboration and support.