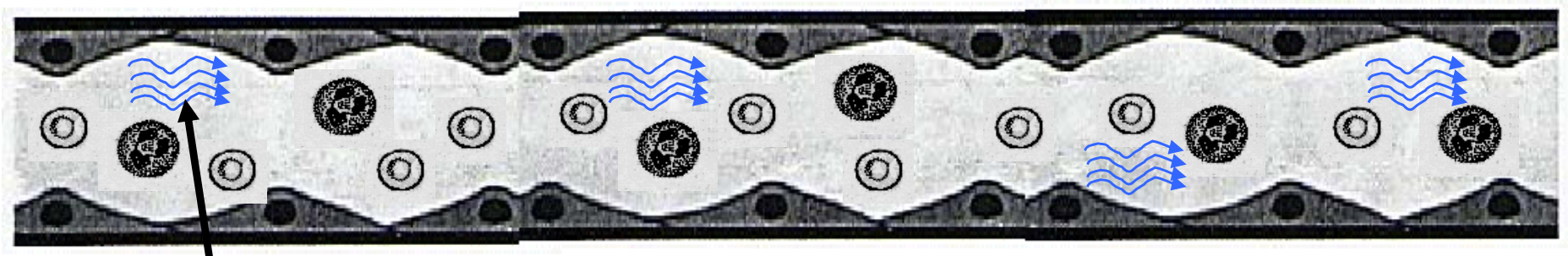

Defence Research & Development Canada
In Toronto
Neutrophil Activation Status in Navy Clearance Divers Following Trimix Dives and In-Water Oxygen Decompression.

Normal Blood Vessel Physiology



Laminar flow

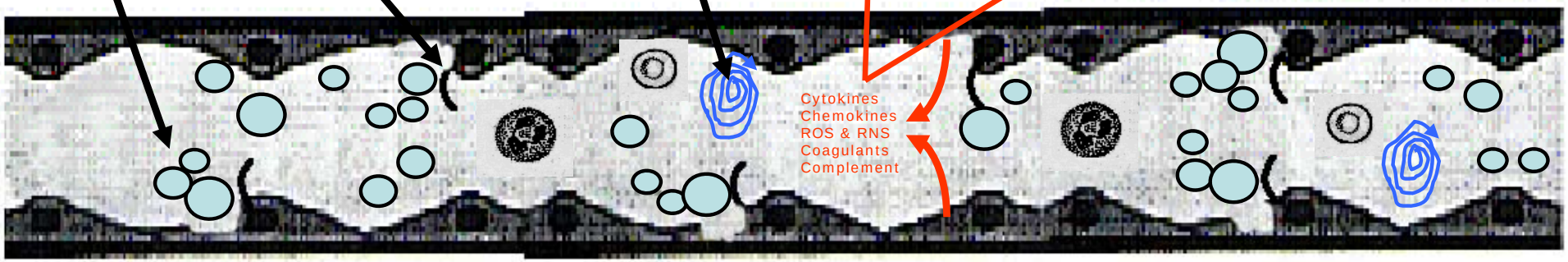
Immunoinflammatory Messengers

Cytokines
Chemokines
Reactive Species (ROS & RNS)
Coagulants
Complement

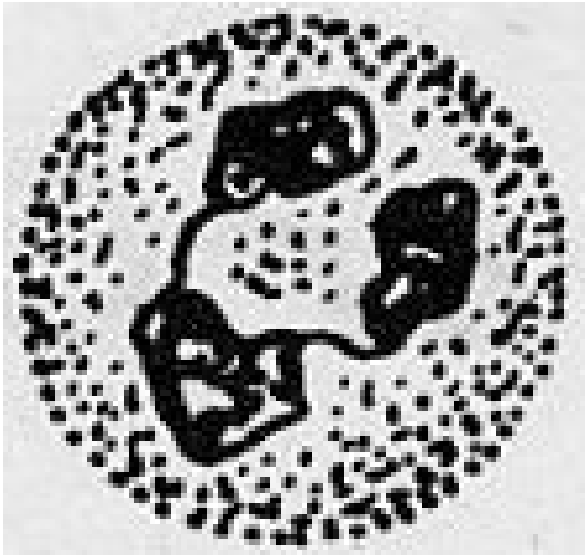
irregular
or oscillatory
shear stress

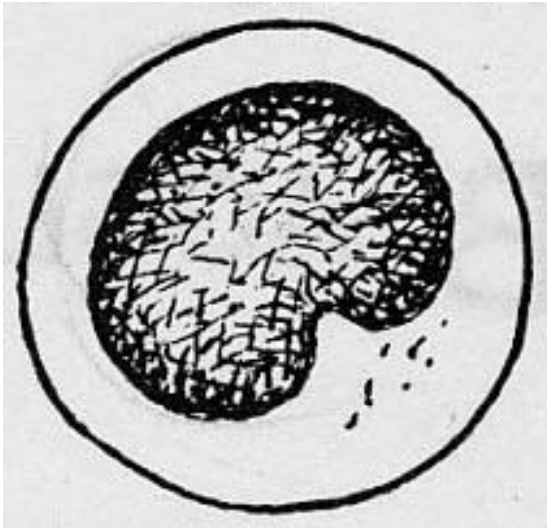
VGE

vascular
trauma



Neutrophils and Monocytes are Cells of the Innate Immune System that Respond to Tissue Injury Caused by Trauma, Attack by Bacteria and Viruses, or Other Injurious Agents



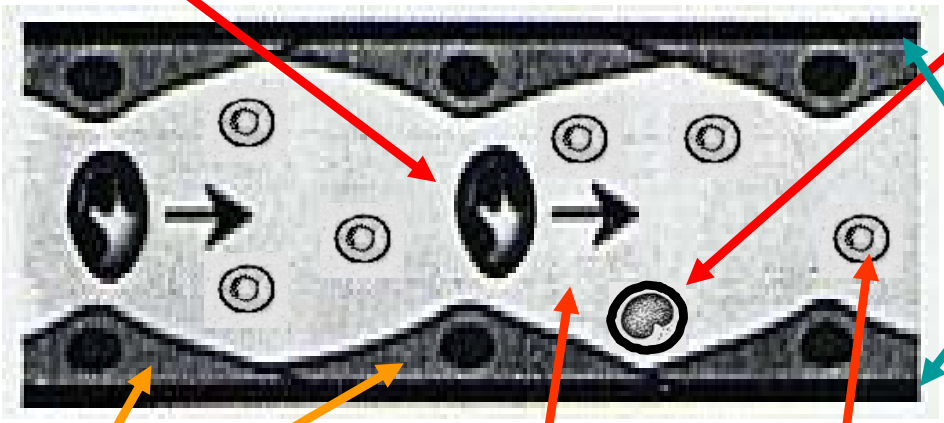


Neutrophils (50%) of PBLs

(4000-5000 cells/mL blood)

Monocytes

(300-400 cells/mL blood)



Vessel smooth muscle

Plasma

Red Blood Cells

Blood Vessel Endothelial Cells

The Main Character of Our Investigation

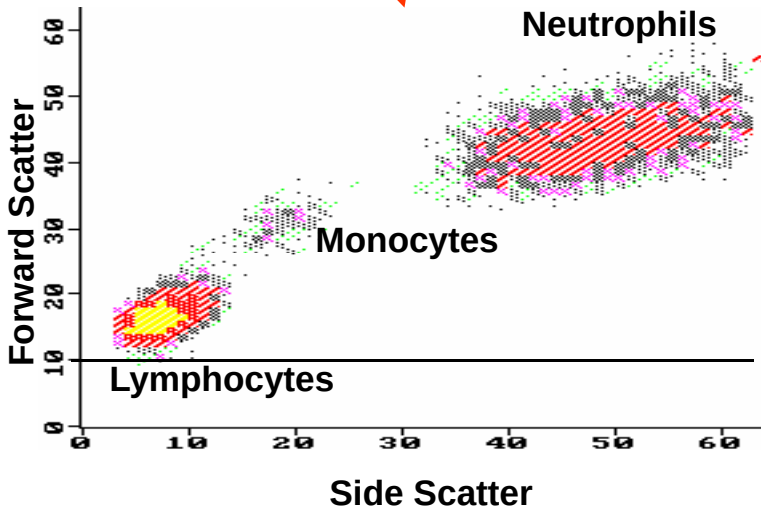
Neutrophil Activation

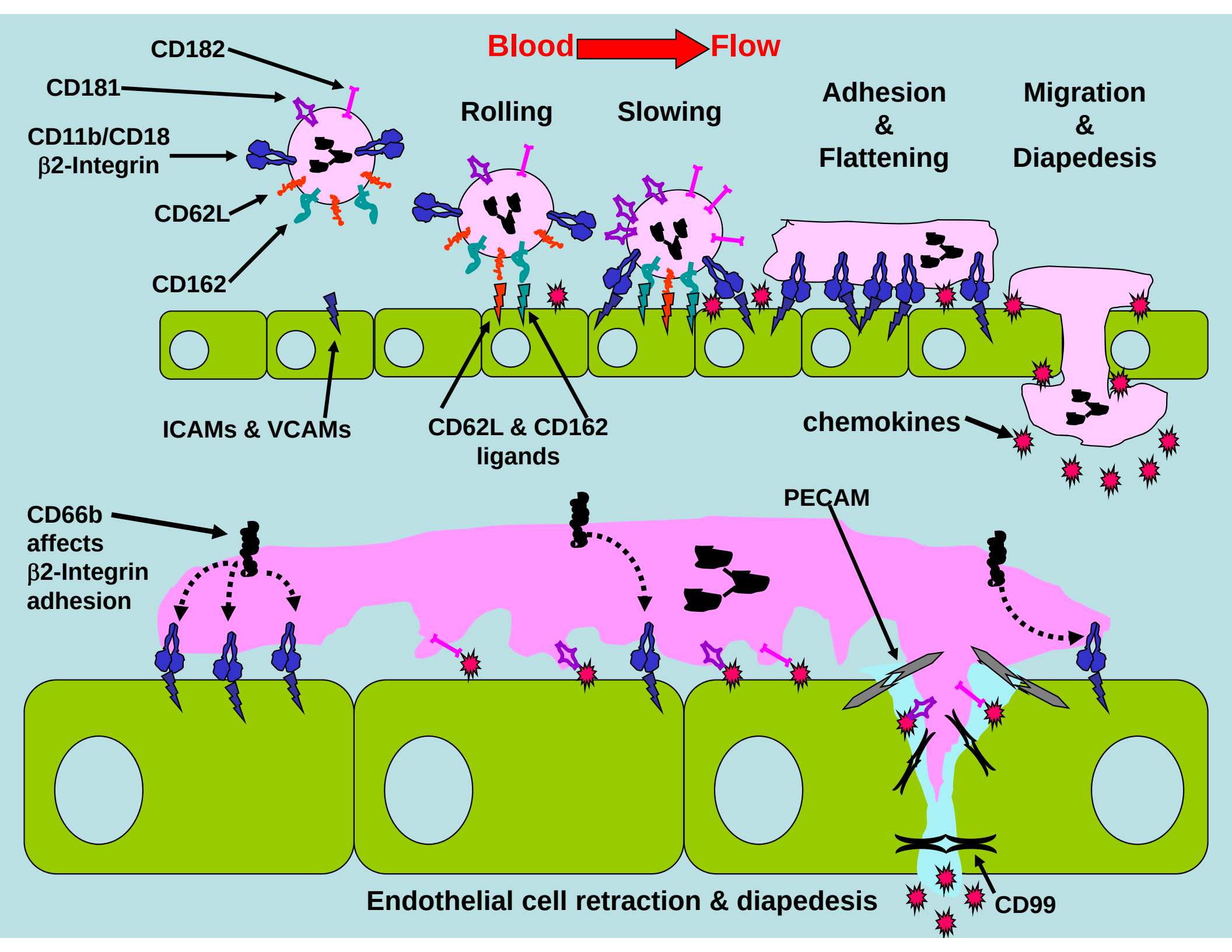
Immunoinflammatory Messengers

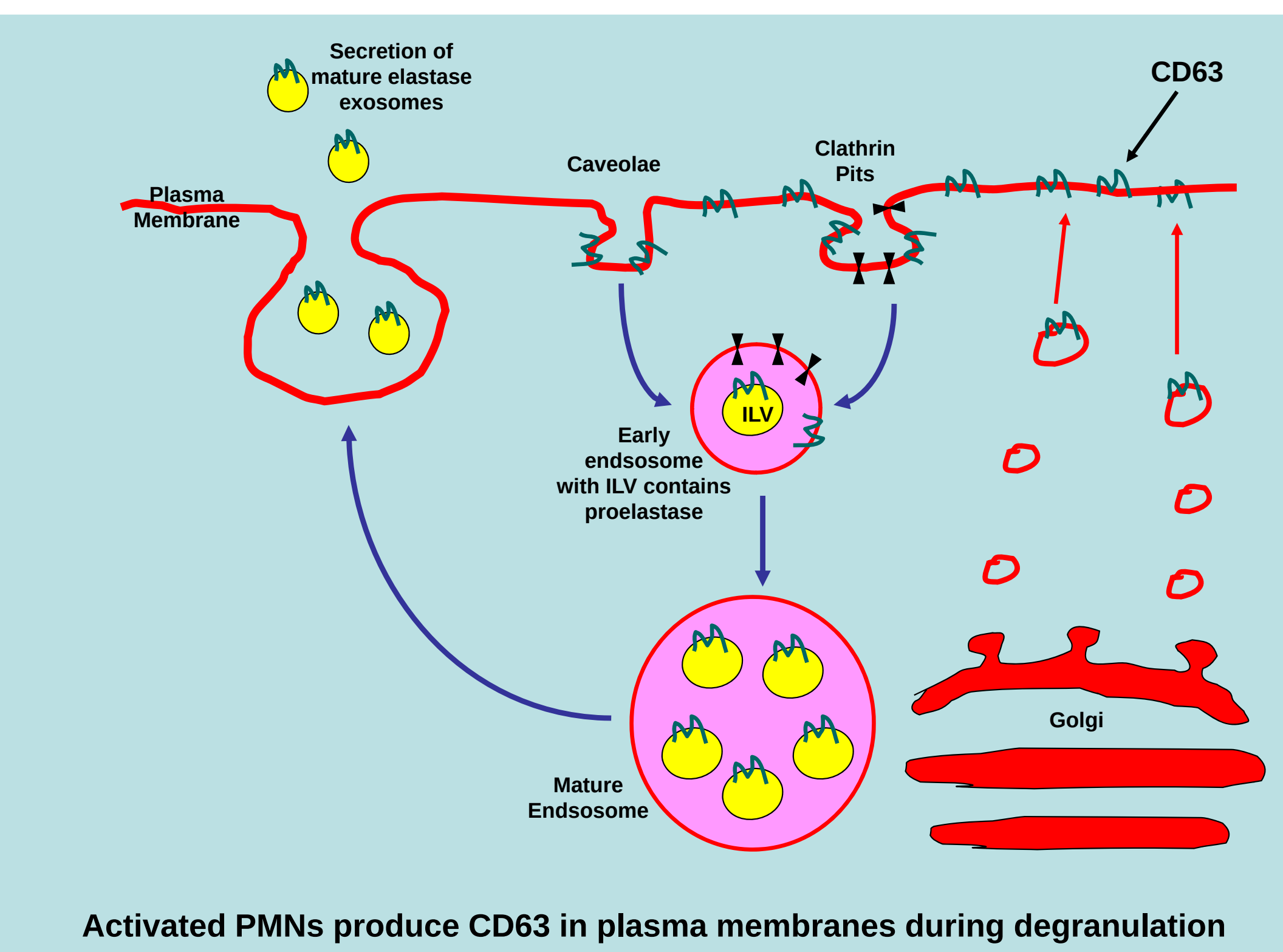
- Cytokines
- Chemokines
- Reactive Species (ROS & RNS)
- Coagulants
- Complement

Neutrophils

Flow Cytometry with mAbs

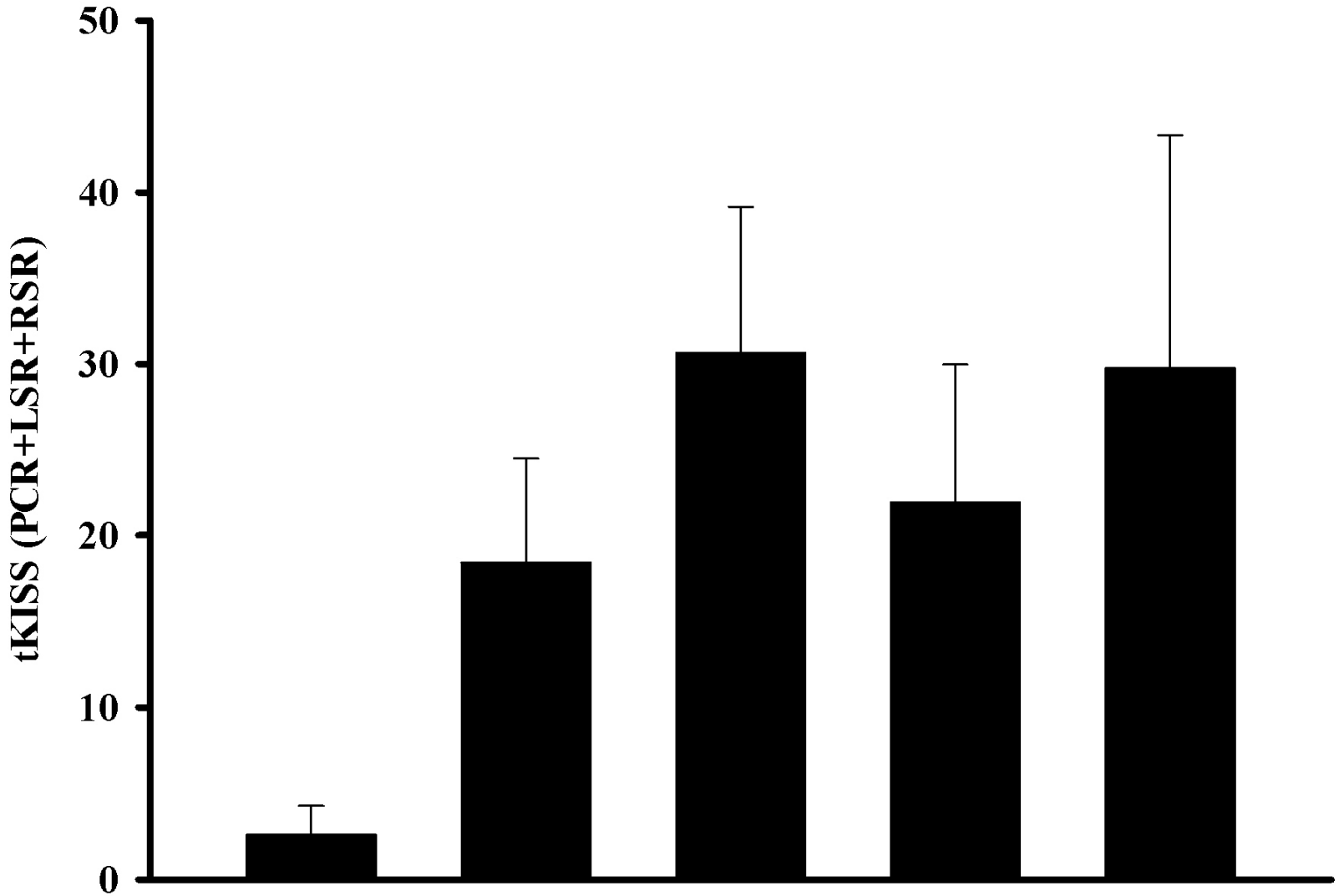



Blood
Flow
CD182
CD181
CD11b/CD18
β2-Integrin
CD62L
CD162
Rolling
Slowing
Adhesion
&
Flattening
Migration
&
Diapedesis
ICAMs & VCAMs
CD62L & CD162
ligands
chemokines
CD66b
affects
β2-Integrin
adhesion
PECAM
Endothelial cell retraction & diapedesis
CD99

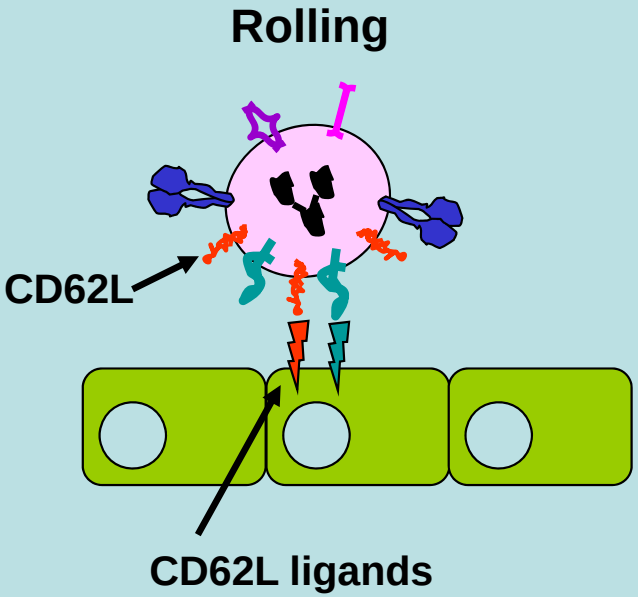


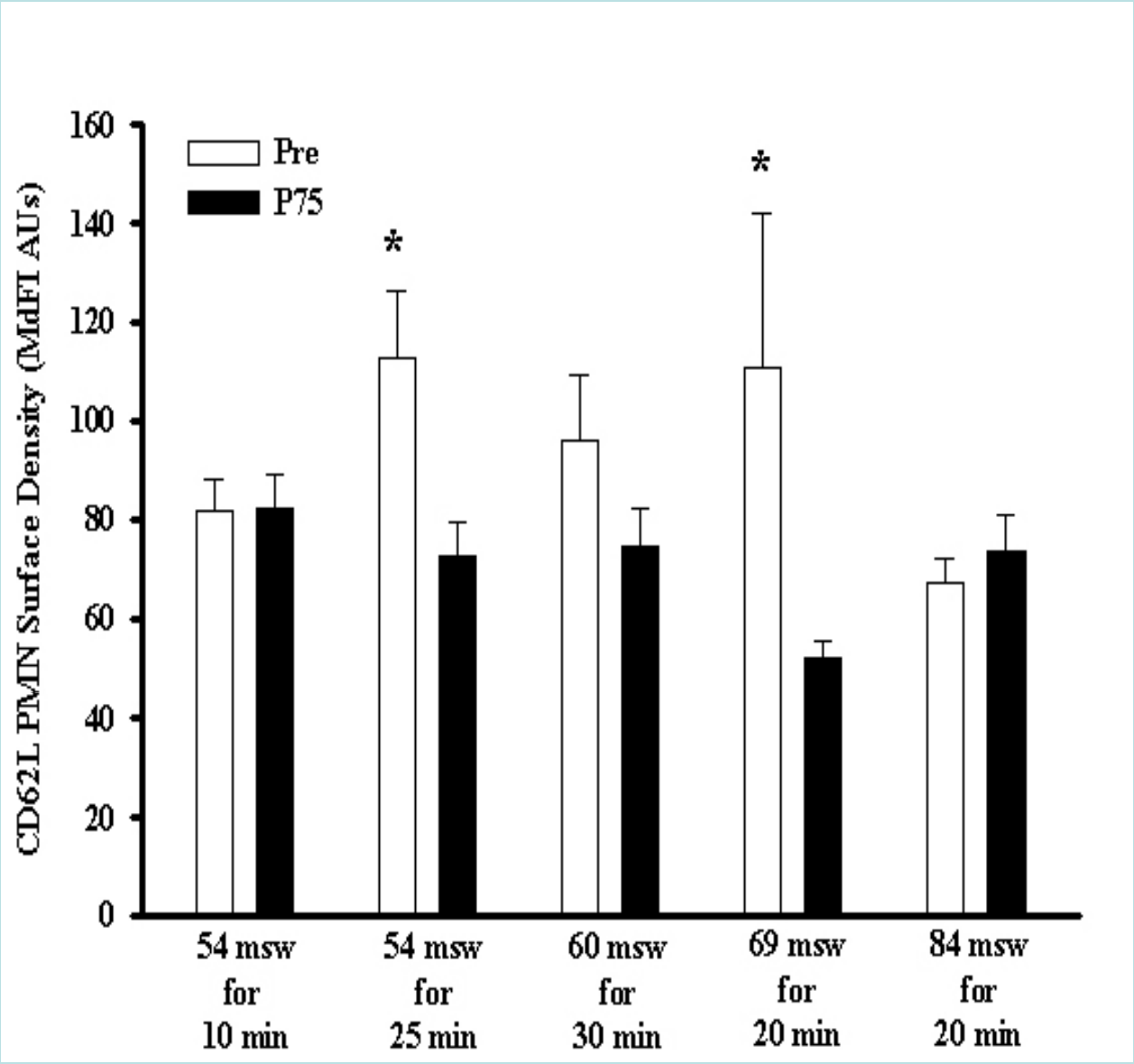
Activated PMNs produce CD63 in plasma membranes during degranulation

Total Kisman Integrated Severity Scores (tKISS) following Doppler detection of VGE in the precordium and left and right subclavian veins at rest



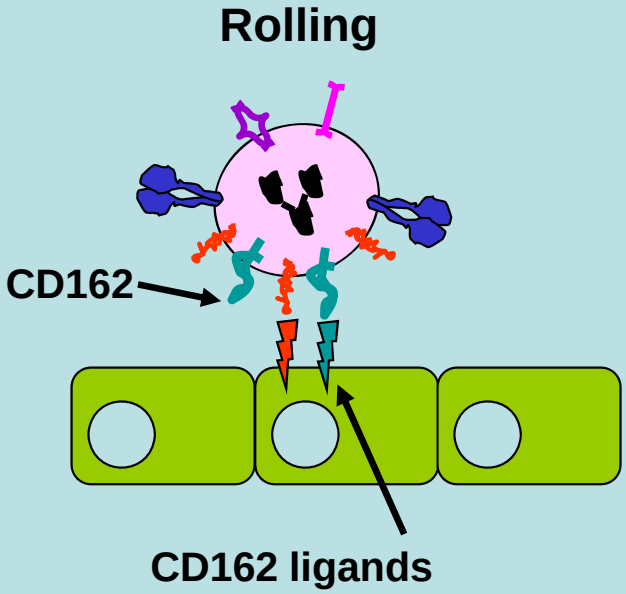
O_2 deco @ 9 msw	11 min	46 min	67 min	64 min	74 min

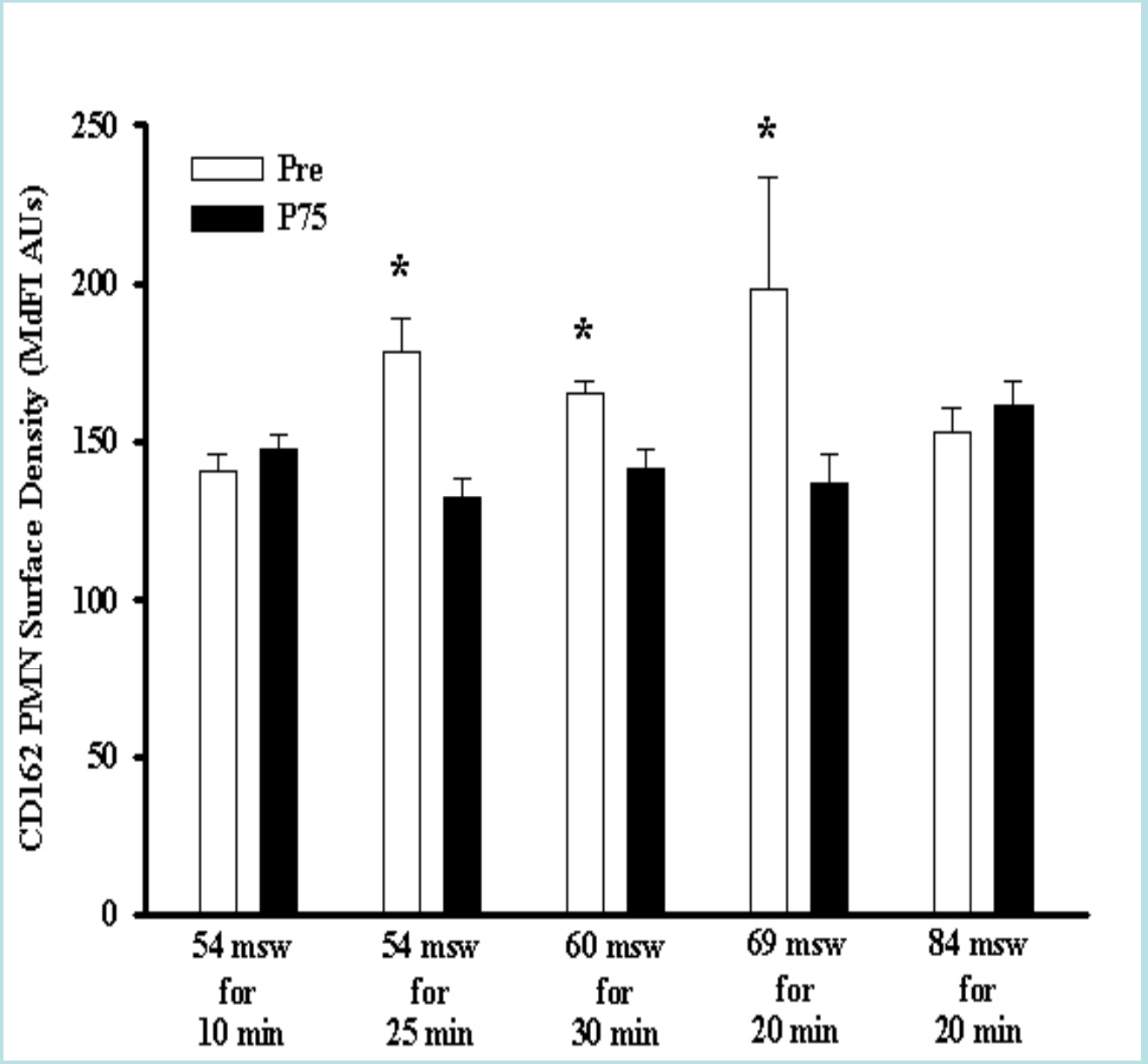




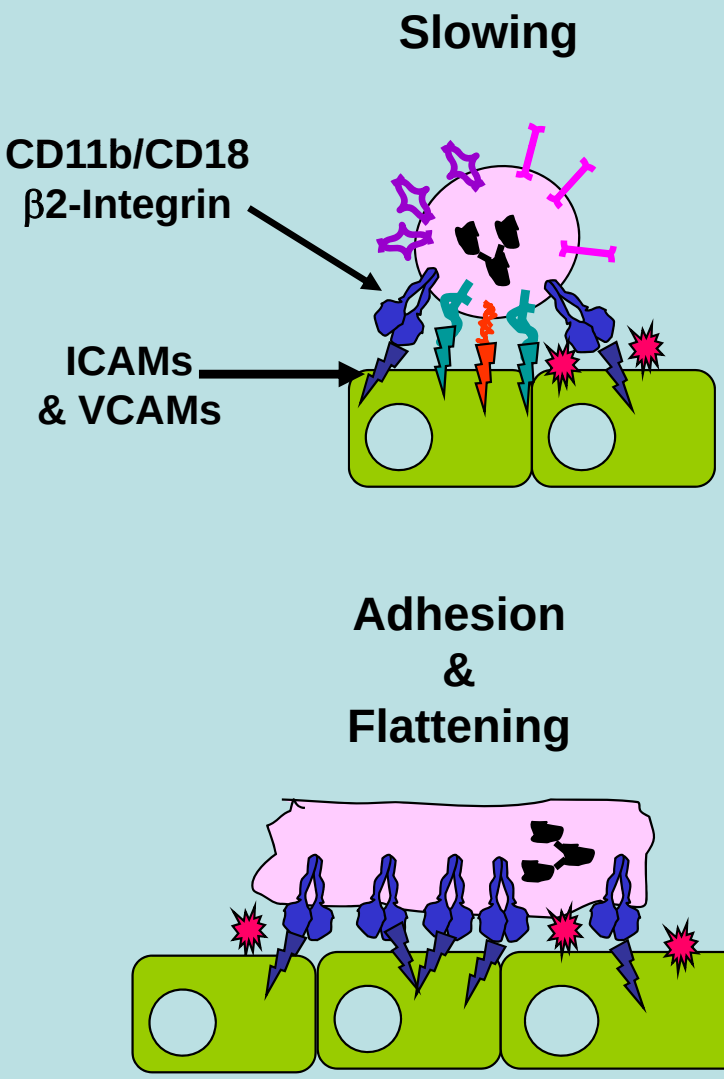
CD62L may be a suitable marker protein for decompression stress and DCS

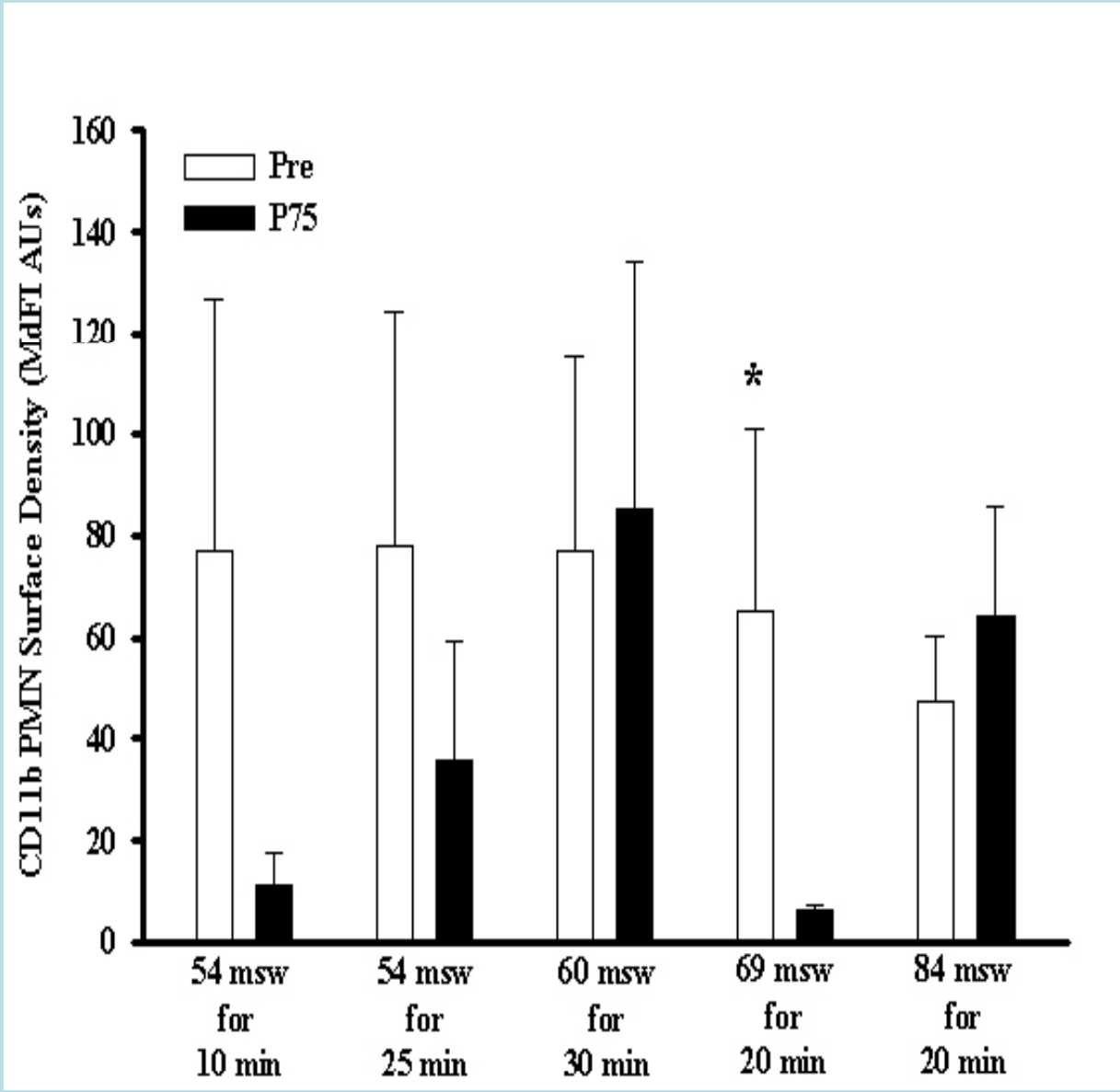
but the protein has a soluble anti-inflammatory role that is complex





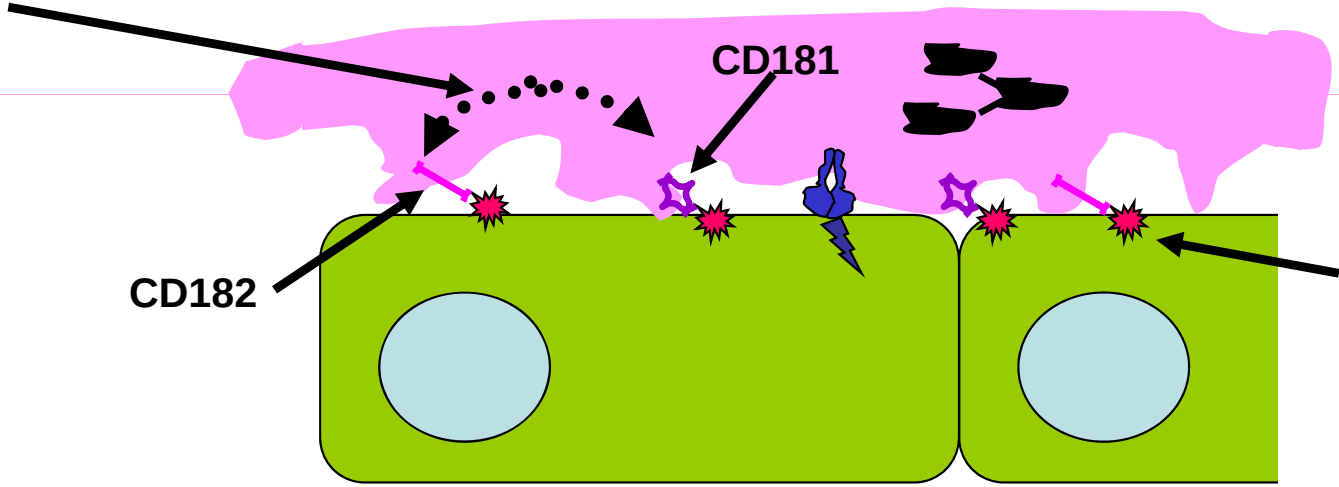
CD162 may be a suitable marker protein for decompression stress and DCS but the protein has a soluble anti-inflammatory role that is complex

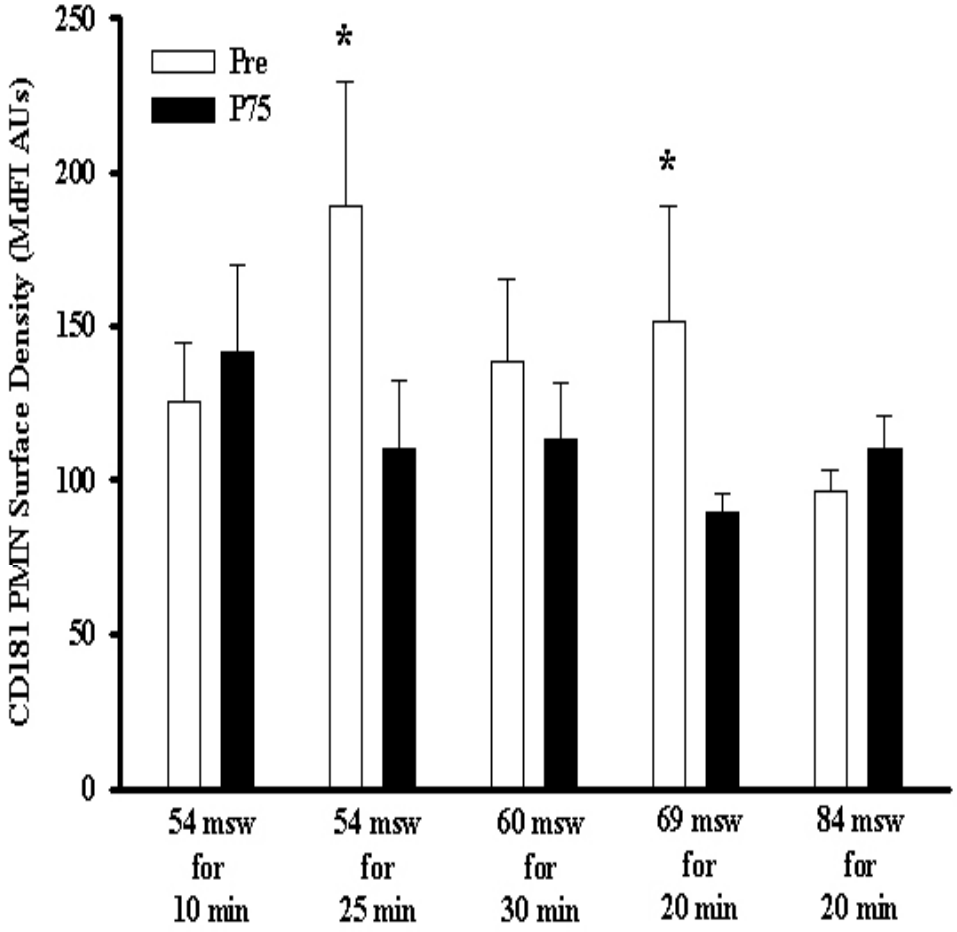


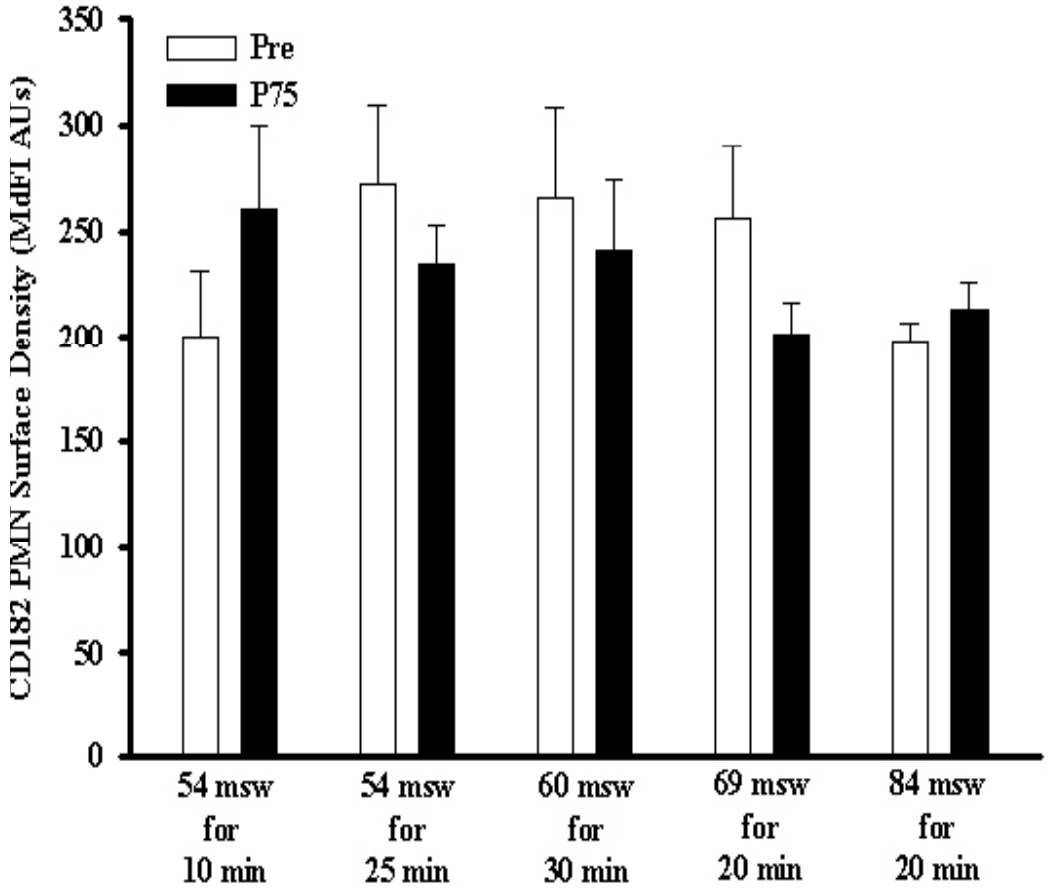


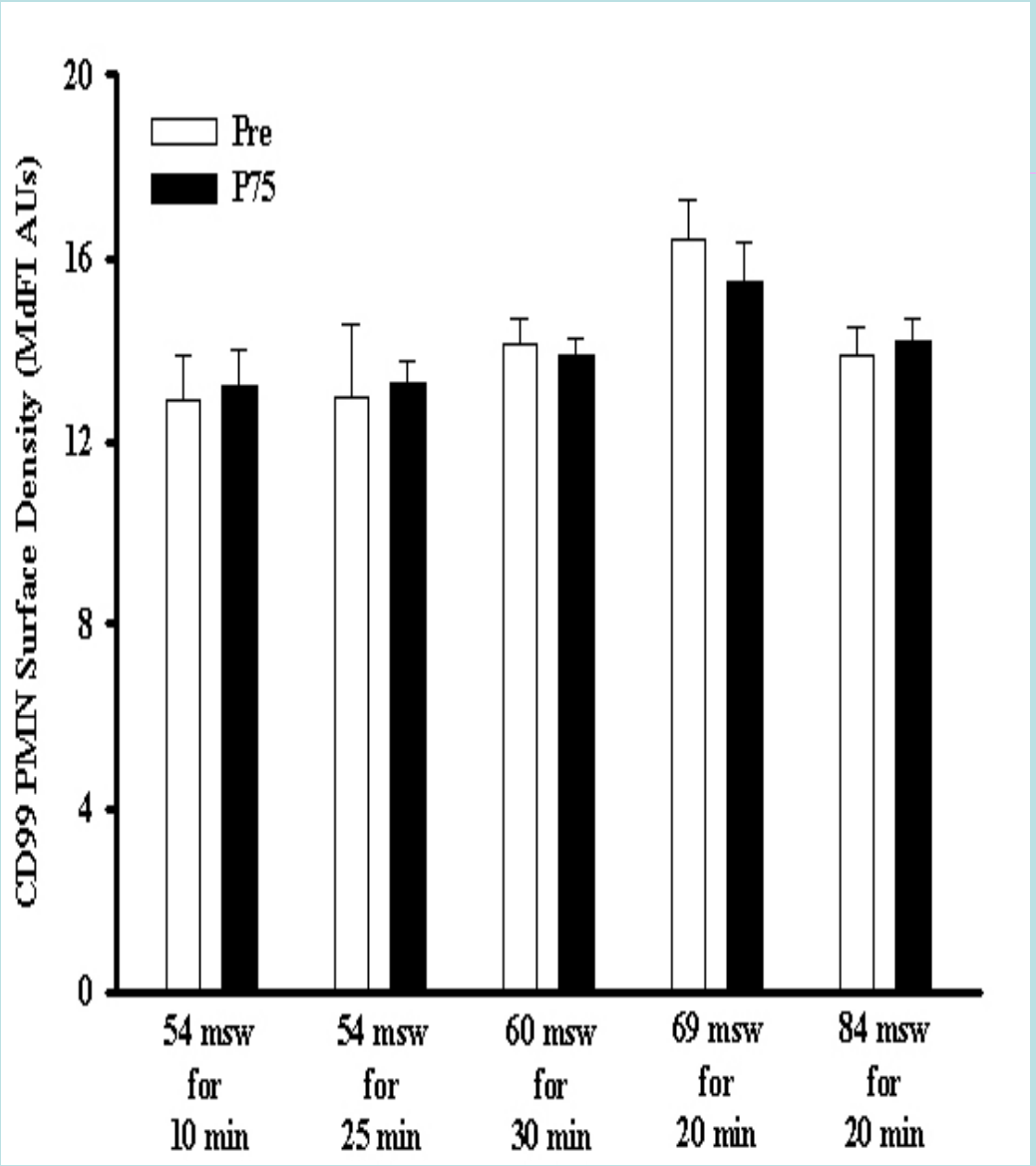
CD11b may be a suitable marker protein for decompression stress and DCS

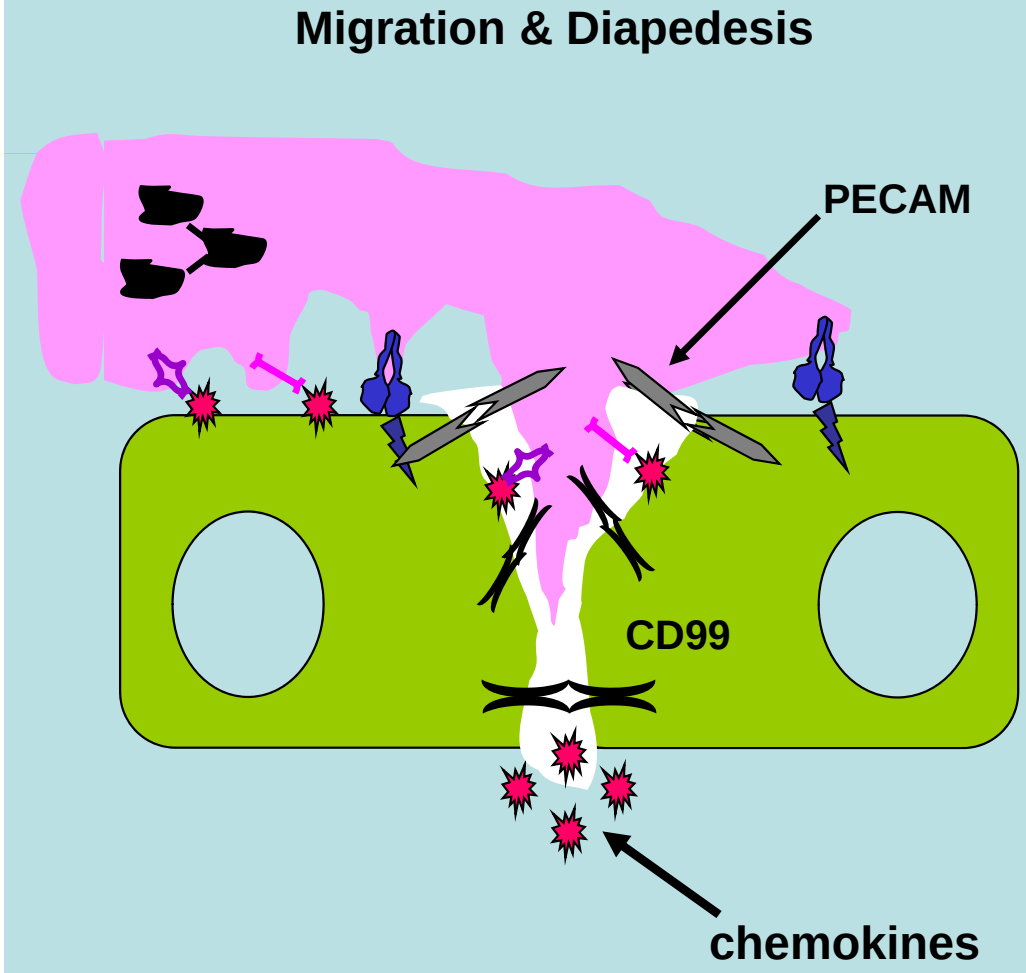
Interactions between CD181 & CD182 make their use as markers complex



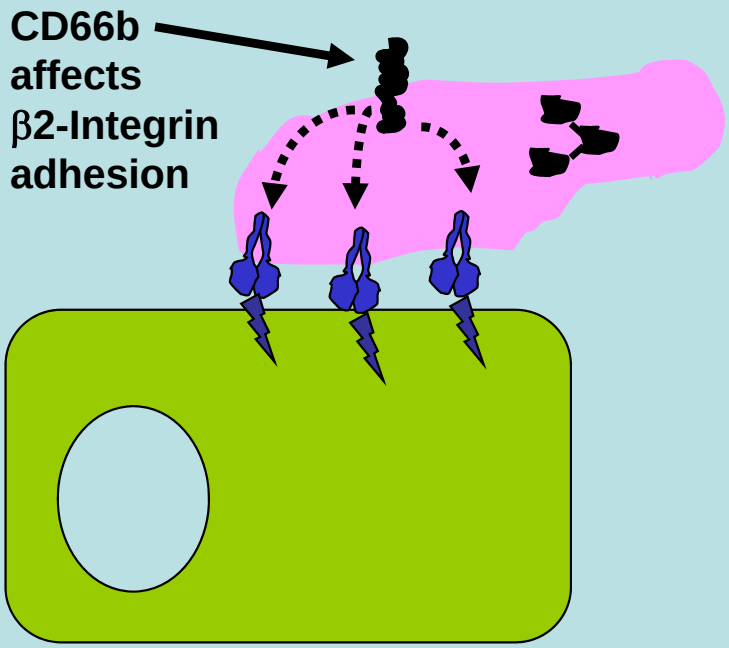


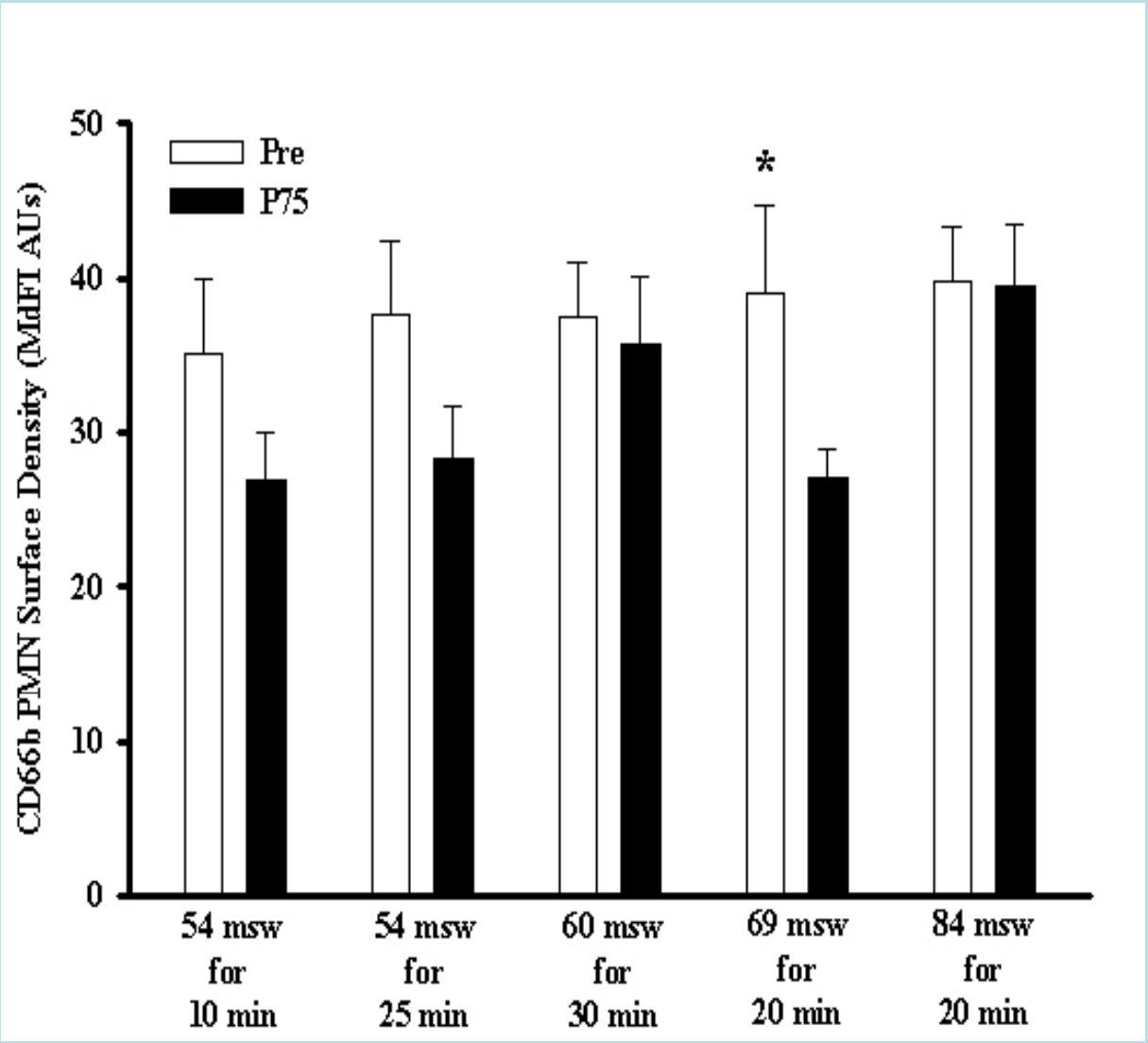




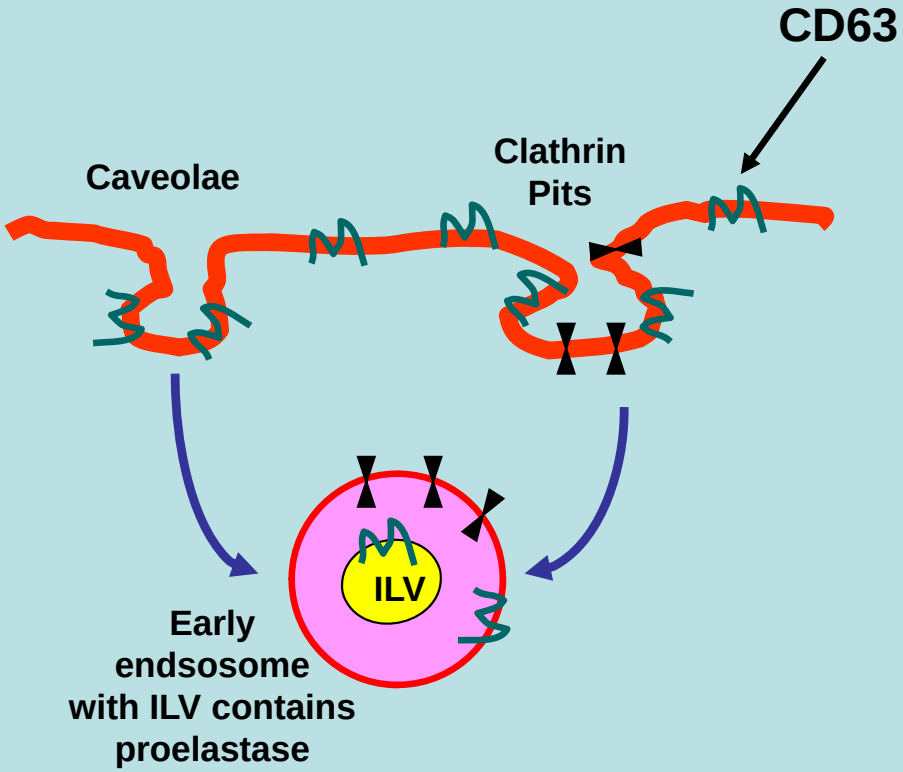


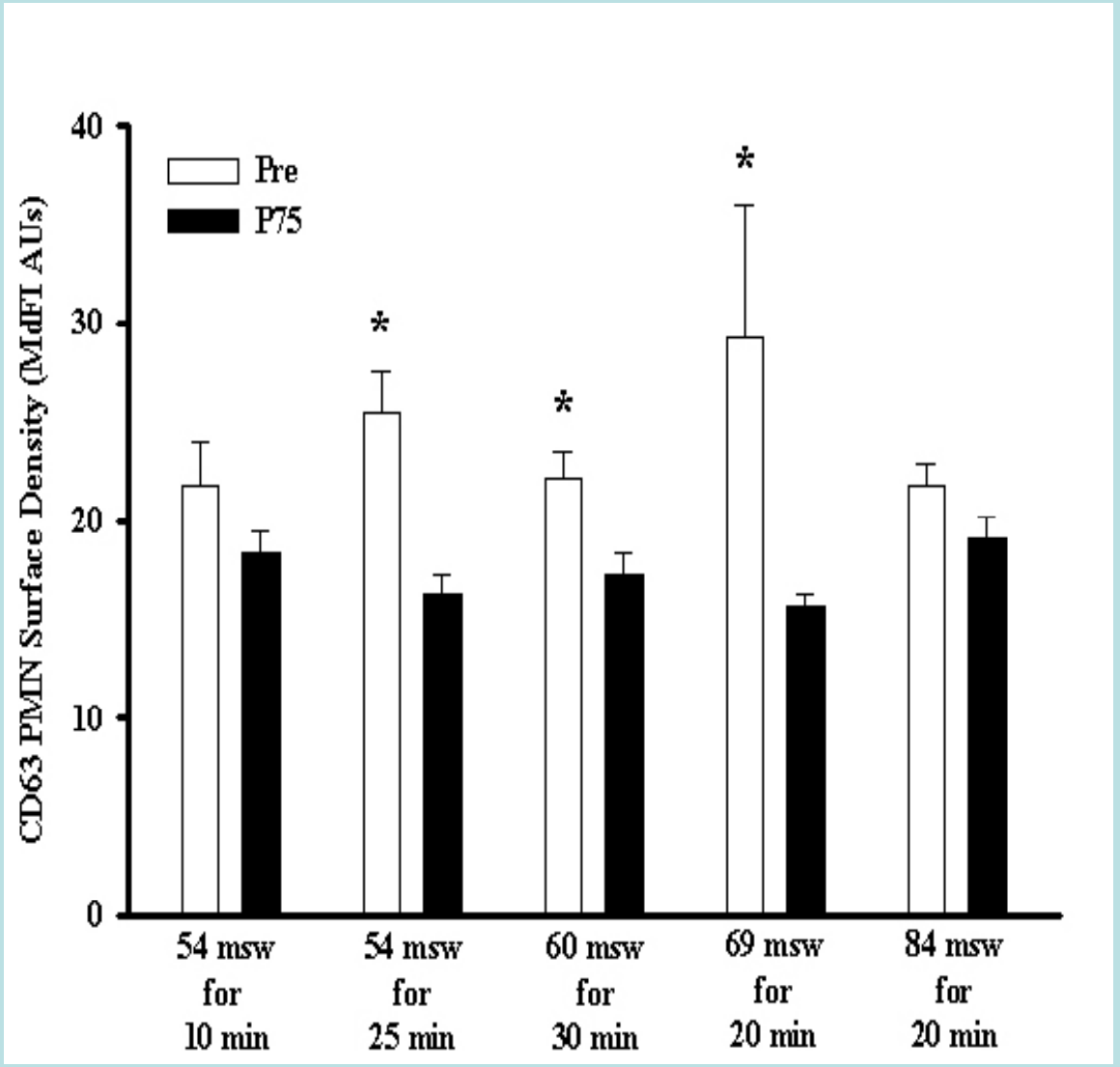
CD99 may not be a suitable marker protein for decompression stress and DCS



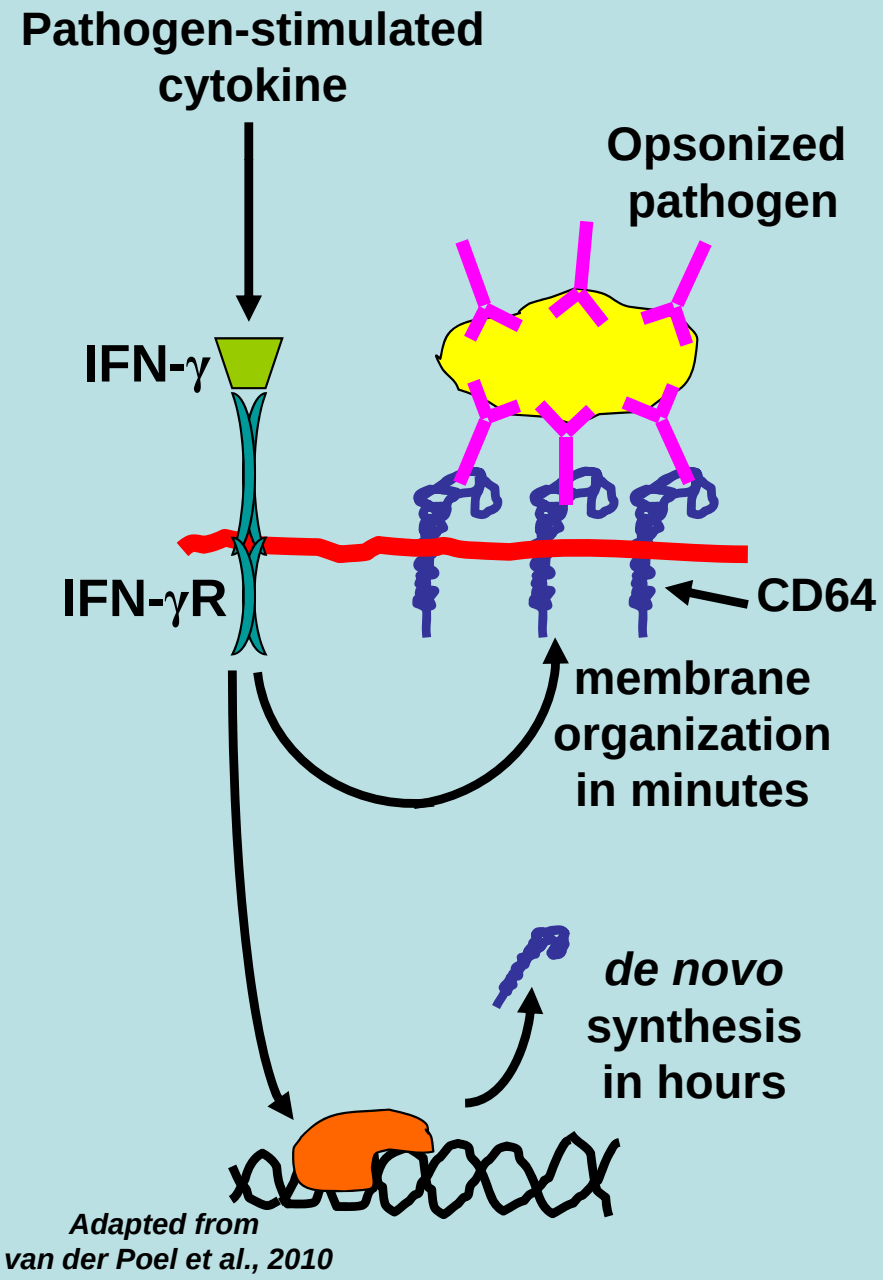


CD66b may be a suitable marker protein for decompression stress and DCS

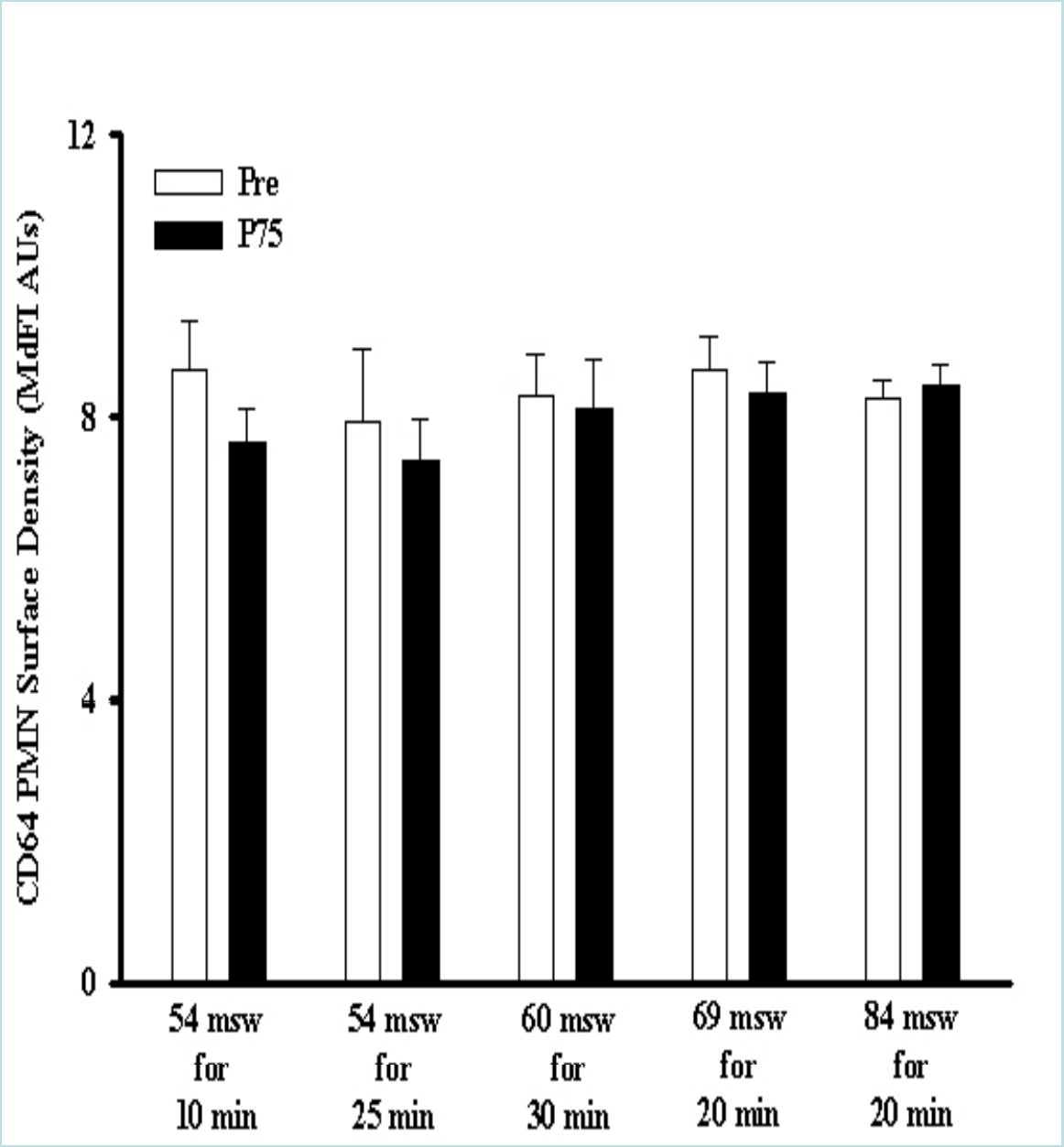




CD63 may be a suitable marker protein for decompression stress and DCS



Adapted from van der Poel et al., 2010



CD64 may not be a suitable marker protein for decompression stress and DCS due to its sensitivity to pathogen infection

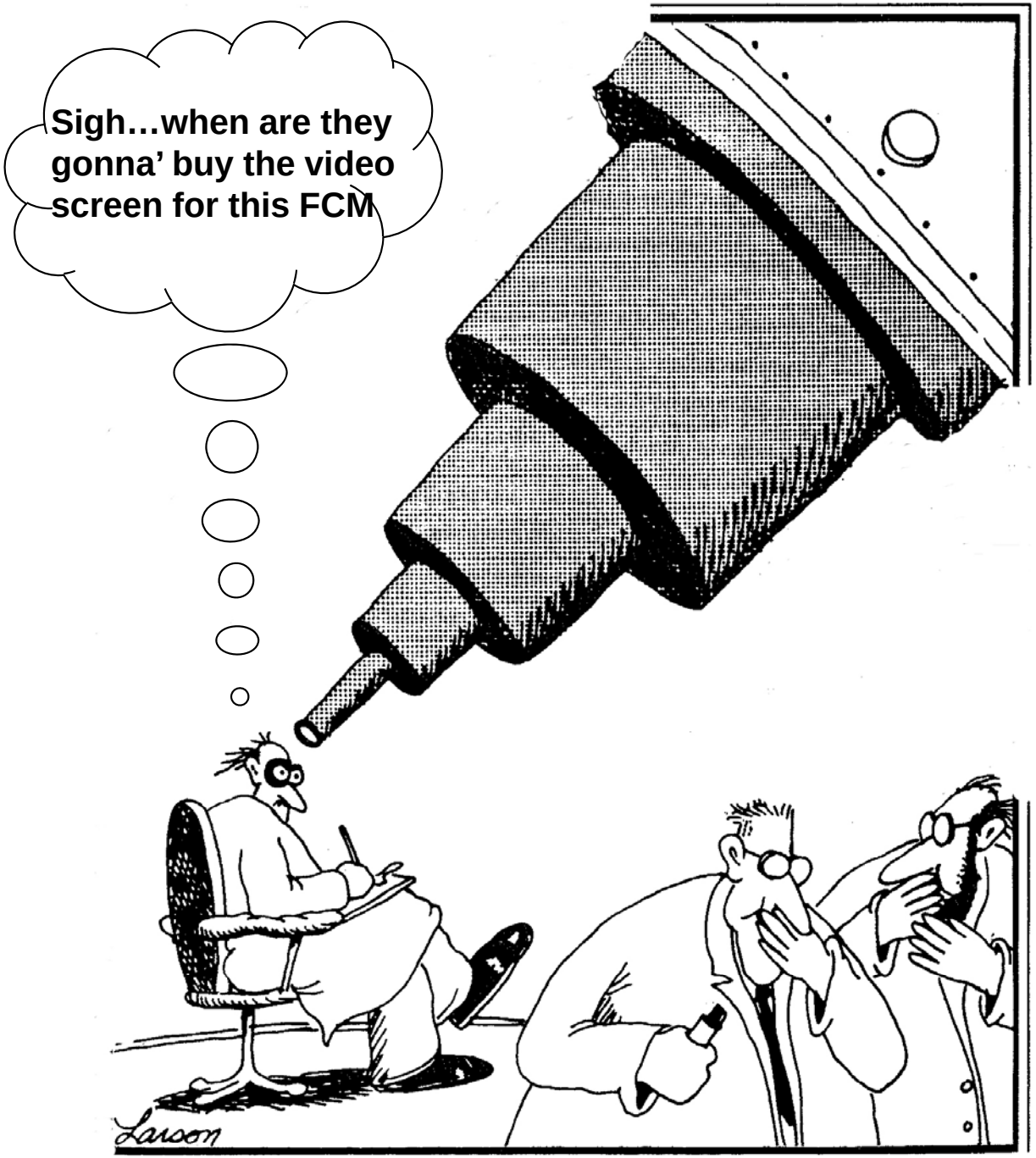
Summary

Of the 9 surface neutrophil proteins examined, CD11b, CD63 and CD66b appeared to be the most suitable candidates for markers during decompression stress.

We cannot explain the decreased surface expression of CD11b, CD63 and CD66b following the dives.

We are mindful of the effects of HBO on the topography of cell membranes via increased production of nitric oxide (Thom et al., 2008).

We are presently examining these same marker proteins in the neutrophils of navy clearance divers following dives with no oxygen decompression.



EDUG, JOHSC Defense R & D Canada, Toronto

Dr. Tom McLellan
Dr. Shawn Rhind
Dr. Bill Bateman
Dr. Pete Zeindler
Lt.Cdr Neil Holden (RN)
Mr. Ron Nishi
Mr. Dave Eaton
Mrs. Sheila Petrongolo